TABLES

TABLE A-1

SUMMARY OF SOIL SAMPLES COLLECTED FROM GEOPROBE BORINGS
TOSCO REFINING COMPANY - SAN FRANCISCO AREA REFINERIES
RODEO REFINERY

Geoprobe Boring	Total Depth (feet)	Fill Thickness (feet)	Samples Collected	Sample Interval (feet bgs)	Description of Sample Location
GP-40	5	0	GP-40-3.5	3.5 - 4	In native soil horizon
GP-41	1	0.5	-	-	no samples collected
GP-42	18	6	GP-42-15.5	15.5 - 16	Collected in buried soil / colluvial layer
GP-43	16	4.5	GP-43-7.5	7.5 - 8	Collected in buried soil / colluvial layer
GP-44	8	2.5	GP-44-3.5	3.5 - 4	Collected in Pinole Tuff bedrock
GP-45	13	6	GP-45-3.5	3.5 - 4	Collected in fill
			GP-45-7.5	7.5 - 8	Collected in buried soil / colluvial layer
			GP-45-11	11 - 11.5	Collected in buried soil / colluvial layer
GP-46	14.5	6	GP-46-3.5	3.5 - 4	Collected in fill
			GP-46-7.5	7.5 - 8	Collected in buried soil / colluvial layer
GP-47	22.5	15.5	GP-47-7.5	7.5 - 8	Collected in fill just below a coke layer
			GP-47-13.5	13.5 - 14	Collected in fill where occasional coke grains were
			GP-47-21.5	21.5 - 22	Collected in Neroly Fm bedrock
GP-48	23	15	GP-48-4.5	4.5 - 5	Collected in fill where coke conglomerations were
			GP-48-14.5	14.5 - 15	Collected in fill just above a coke layer
GP-49	20	13	GP-49-3.5	3.5 - 4.0	Collected in fill where occasional coke grains were
			GP-49-7.5	7.5 - 8.0	Collected in fill where occasional coke grains were
GP-50	4	3.5	GP-50-2.5	2.5 - 3.0	Collected in fill where coke conglomerations were
GP-51	14.5	14	GP-51-3.5	3.5 - 4	Collected in fill where coke conglomerations were
			GP-51-11	11 - 11.5	Collected in fill where coke conglomerations were
			GP-51-13.5	13.5 - 14	Collected in fill just above bedrock

TABLE A-2

SUMMARY OF SOIL CHEMISTRY DATA FROM GEOPROBE BORINGS
TOSCO REFINING COMPANY - SAN FRANCISCO AREA REFINERIES
RODEO REFINERY

Geoprobe Boring	Sample	TPH-e Concentration (mg/kg)	TPH-e Pattern	PAHs (mg/kg)	PCBs (ug/kg)	Lead (mg/kg)	Mercury (mg/kg)
GP-40	GP-40-3.5'	ND (1.0)	-	ND (0.25 - 0.50)	(a)	7.0	0.028
GP-42	GP-42-15.5'	ND (1.0)	-	ND (0.25 - 0.50)	(a)	4.1	0.012
GP-43	GP-43-7.5'	ND (1.0)	-	ND (0.25 - 0.50)	(a)	4.3	ND (0.010)
GP-44	GP-44-3.5'	ND (1.0)	-	ND (0.25 - 0.50)	(a)	6.5	0.049
GP-45	GP-45-3.5'	13	Diesel and unidentified hydrocarbons >C20	ND (0.25 - 0.50)	(a)	14	0.014
	GP-45-7.5'	2.2	Unidentified hydrocarbons >C16	ND (0.25 - 0.50)	(a)	11	0.029
	GP-45-11'	ND (1.0)	-	ND (0.25 - 0.50)	(a)	4.5	0.015
GP-46	GP-46-3.5'	ND (1.0)	-	ND (0.25 - 0.50)	(a)	6.9	0.072
	GP-46-7.5'	ND (1.0)	-	ND (0.25 - 0.50)	(a)	5.4	0.015
GP-47	GP-47-7.5'	200	Diesel and unidentified hydrocarbons >C20	benzo(a)anthracene: 0.76 benzo(b)fluoranthene: 0.70 benzo(a)pyrene: 0.69 chrysene: 1.2	ND (20 - 80)	26	0.057
	GP-47-13.5'	ND (1.0)	-	ND (0.25 - 0.50)	(a)	5.0	0.026
	GP-47-21.5'	ND (1.0)	-	ND (0.25 - 0.50)	(a)	4.0	ND (0.010)
GP-48	GP-48-4.5'	240	Diesel and unidentified hydrocarbons >C20	ND (0.25 - 0.50)	ND (20 - 80)	190	0.30

TABLE A-2

SUMMARY OF SOIL CHEMISTRY DATA FROM GEOPROBE BORINGS
TOSCO REFINING COMPANY - SAN FRANCISCO AREA REFINERIES
RODEO REFINERY

Geoprobe Boring	Sample	TPH-e Concentration (mg/kg)	TPH-e Pattern	PAHs (mg/kg)	PCBs (ug/kg)	Lead (mg/kg)	Mercury (mg/kg)
GP-48 (contd.)	GP-48-14.5'	6,500	Diesel and unidentified hydrocarbons >C20	benzo(a)anthracene: 33 benzo(b)fluoranthene: 24 benzo(a)pyrene: 24 chrysene: 46 phenanthrene: 19 pyrene: 14	PCB 1254: 82	17	0.59
GP-49	GP-49-3.5'	23	Diesel and unidentified hydrocarbons >C20	ND (0.25 - 0.50)	(a)	170	0.11
	GP-49-7.5'	ND (1.0)	-	ND (0.25 - 0.50)	(a)	5.3	0.019
GP-50	GP-50-2.5'	67	Unidentified hydrocarbons >C18	ND (1.3 - 2.5)	ND (20 - 80)	170	0.66
GP-51	GP-51-3.5'	200	Diesel and unidentified hydrocarbons >C20	chrysene: 1.5	ND (20 - 80)	14	0.088
	GP-51-11'	6.1	Unidentified hydrocarbons >C15	ND (0.25 - 0.50)	(a)	6.5	0.066
	GP-51-13.5'	ND (1.0)	-	ND (0.25 - 0.50)	(a)	3.4	0.095
	Method:	***3550 / 8015m***		***8270***	***8080***	***7420***	***7471***

TPH-e - extractable total petroleum hydrocarbons
mg/kg - milligrams per kilogram
ND - Not detected equal to or greater than method reporting limit shown in par
PAHs - polynuclear aromatic hydrocarbons
PCBs - polychlorinated biphenols
µg/kg - micrograms per kilogram

(a) - PCB data pending. Qualitative review of EPA Method chromatograms indicated no PCBs present in sample.

TABLE A-3

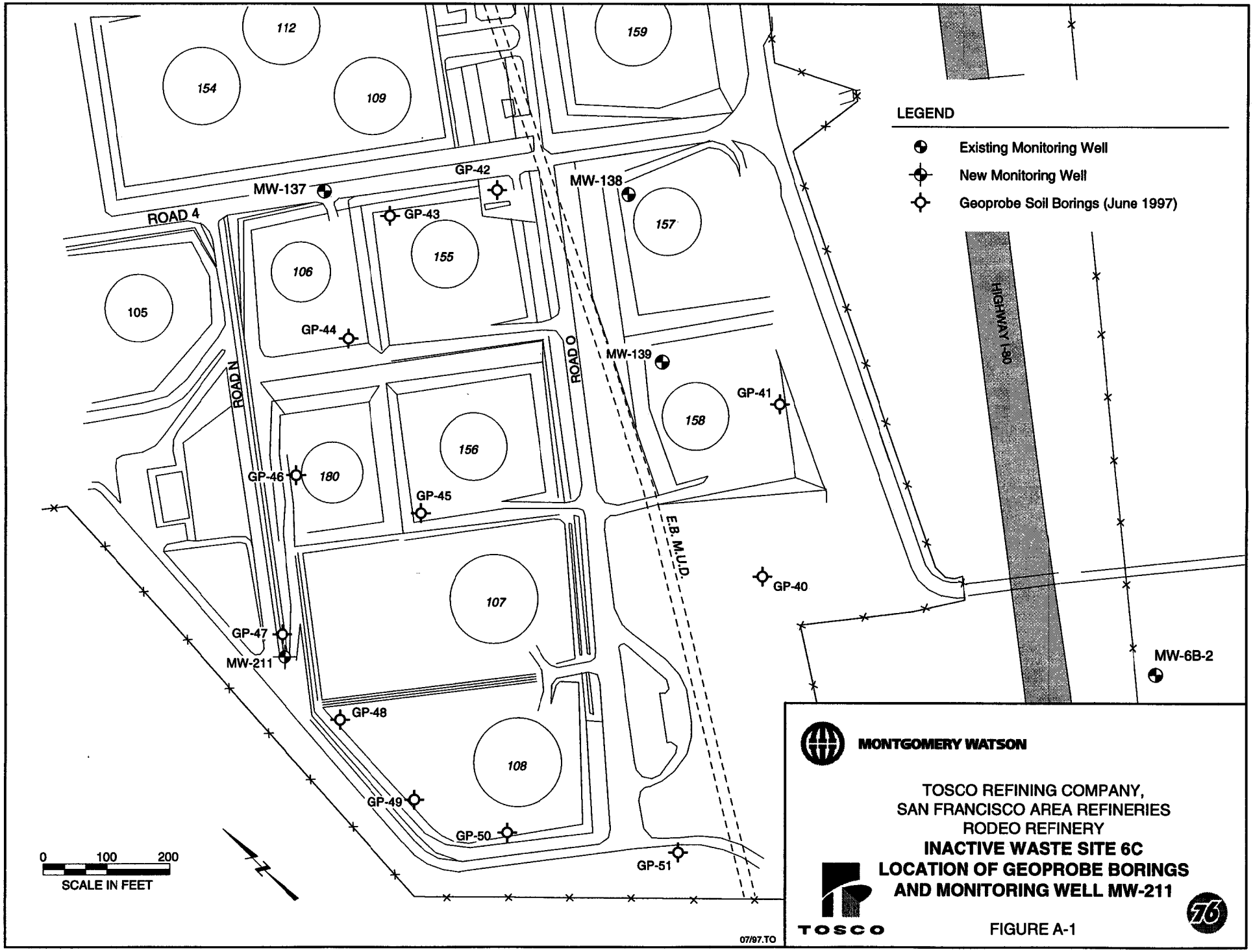
SUMMARY OF WATER CHEMISTRY DATA
TOSCO REFINING COMPANY - SAN FRANCISCO AREA REFINERIES
RODEO REFINERY

Well	TPH-e		Benzene	Toluene	Ethyl-Benzene	Total Xylenes	PAHs	PCBs	Lead	Mercury
	Concentration (µg/L)	Pattern	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)		(µg/L)	(µg/L)
MW-137	1,200	diesel and unidentified hydrocarbons <C15	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	2-methylnaphthalene (10) all other compds. ND (5.0 - 10)	(a)	7.8	ND (2.0)
MW-139	ND (50)	-	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (5.0 - 10))	(a)	ND (2.0)	ND (2.0)
MW-211	ND (50)	-	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (5.0 - 10))	(a)	ND (2.0)	ND (2.0)
MW-6B2	ND (50)	-	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (5.0 - 10))	(a)	ND (2.0)	ND (2.0)
	3510 / 8015m		***5030/ 8020***	***5030/ 8020***	***5030/ 8020***	***5030/ 8020***	***8270***	-	***7421***	***7470***

TPH -e - extractable total petroleum hydrocarbons
mg/L- milligrams per liter
ND - Not detected equal to or greater than method reporting limit shown in parenthesis.
PAHs - polynuclear aromatic hydrocarbons
PAHs - polynuclear aromatic hydrocarbons
µg/L - micrograms per liter

PCBs - polychlorinated biphenols

(a) PCB data pending. Qualitative review of EPA Method 8270 chromatogram indicated no PCBs present


LEGEND
Existing Monitoring Well
New Monitoring Well
Geoprobe Soil Borings (June 1997)
112
154
109
159
157
155
106
105
158
156
180
107
108
MW-137
MW-138
MW-139
MW-211
MW-6B-2
GP-42
GP-43
GP-44
GP-45
GP-46
GP-47
GP-48
GP-49
GP-50
GP-51
GP-40
GP-41
ROAD 4
ROAD N
ROAD O
HIGHWAY I-80
E.B. M.U.D.
0 100 200
SCALE IN FEET
07/97.TO
MONTGOMERY WATSON
TOSCO REFINING COMPANY,
SAN FRANCISCO AREA REFINERIES
RODEO REFINERY
INACTIVE WASTE SITE 6C
LOCATION OF GEOPROBE BORINGS
AND MONITORING WELL MW-211
TOSCO
FIGURE A-1

Attachment A-3

Addendum to the Inactive Waste Site 6C Report – "Results of Additional Investigation and Remediation Plan, August 1, 1997." January 7, 1998.

MONTGOMERY WATSON.

FILE COPY

January 7, 1998

Mr. Terry Seward
California Regional Water Quality Control Board
San Francisco Bay Region
2101 Webster Street, Suite 500
Oakland, CA 94612

RE: Addendum to the Inactive Waste Site 6C Report-
"Results of Additional Investigation and Remediation Plan, August 1, 1997"
Tosco Refining Company, San Francisco Area Refinery at Rodeo

Dear Mr. Seward:

This letter is an addendum to the report, "Results of Additional Investigation and Remediation Plan - Inactive Waste Site 6C", which was submitted to the San Francisco Bay Regional Water Quality Control Board (RWQCB) on August 1, 1997 (Montgomery Watson, 1997). The purpose of the addendum is to submit (1) polychlorinated biphenol (PCB) soil and water chemistry data that were pending at the time of the original report, (2) the cumulative quality assurance / quality control (QA/QC) report for all investigation samples, and (3) the logs for the completed Geoprobe borings and monitoring well. Each of these items were not included in the original Inactive Waste Site 6C (IWS 6C) summary report because of time constraints.

A brief review of the IWS 6C project objectives is included in the background section presented below. PCB soil and water chemistry data and the results of the QA/QC review are presented in the subsequent sections. Logs for the monitoring well (MW-211) and the Geoprobe borings (GP-40 through GP-51) completed during the investigation are included in Attachment 1.

BACKGROUND

A "Work Plan for Additional Investigation at Inactive Waste Site 6C" was approved by RWQCB in May 1997. The proposed soil and groundwater investigations were completed in June and July 1997 and used to develop a remediation plan for the site. The work plan, investigations, and remediation plan were completed in accordance with Provision C.2.J of the RWQCB Updated Waste Discharge Requirements (WDRs) Order Number 97-207.

The investigation summary report and remediation plan dated August 1, 1997 concluded that residual hydrocarbons and a discrete layer of petroleum compounds interpreted as coke

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are present in fill material within the area identified as IWS 6C, but that leachate from the waste materials is not impacting groundwater. The plan recommended quarterly groundwater sampling from four monitoring wells; active remediation was not recommended because the expected mobility of the compounds in the fill is low and the hydrocarbon content is subject to natural attenuation. The plan also suggested that monitoring be reduced to a semi-annual frequency after one year, and that well MW-138 be included in the groundwater sampling program if free-phase liquid hydrocarbon are successfully removed from well MW-138.

PCB SOIL AND WATER CHEMISTRY RESULTS

The RWQCB requested that soil and groundwater samples from the investigation be tested for PCBs. PCB data from 15 of the 20 soil samples collected during the field program were still pending at the time the summary report was submitted to the RWQCB. Groundwater samples collected from the IWS 6C wells during the Summer quarter 1997 monitoring event were also analyzed for PCBs. Revised soil and water chemistry data tables that include the PCB results are attached to this addendum as Tables 1 and 2, respectively.

PCBs were not detected in the 15 soil samples that had yet to be reported (see bold / italicized data in Table 1), although these data have been qualified as estimated with a low bias as discussed in the QA/QC review below. Combined with the originally reported PCB data, the only detection of PCB's during the IWS 6C investigation was PCB 1254 (82 ug/kg) in sample GP-48-14.5'.

Groundwater samples from four of the IWS 6C wells sampled during the first week of August 1997 were also analyzed for PCBs using method 8080. PCBs were not detected above method quantitation limits (0.50 to 2.0 ug/L) in the four groundwater samples (see bolded / italicized data in Table 2).

QUALITY ASSURANCE / QUALITY CONTROL REVIEW

The following is a summary of the quality assurance / quality control (QA/QC) review conducted on the IWS 6C soil and groundwater chemistry data.

The subject samples were collected between June 25 and July 9, 1997 and chemically tested by Sequoia Analytical (Sequoia), of Walnut Creek, California, under direct contract to Tosco. Samples were analyzed by the following methods:

- Aromatic volatile organic compounds (AVOCs) by EPA Method 8020

- Semivolatile organic compounds (SVOCs) including polyaromatic hydrocarbons (PAHs) and PCBs by EPA Method 8270

- Total extractable petroleum hydrocarbons (TPH-e) by California modified EPA Method 8015 with extraction by EPA Method 3510 and silica gel cleanup by EPA 3630

- PCBs by EPA Method 8080

- Lead by EPA Method 7421

- Mercury in water by EPA Method 7470 and in soil by EPA Method 7471

The chemistry data meet the data quality objectives for this program and are considered acceptable for the intended uses.

All data were reviewed for precision, accuracy, representativeness, completeness, and comparability (the PARCC criteria). Precision and accuracy were evaluated based on the QC results from laboratory control and laboratory control duplicate (LCS/LCSD) sample recoveries and relative percent differences (RPDs), matrix spike/matrix spike duplicate (MS/MSD) sample recoveries and RPDs, and surrogate recoveries. All samples were evaluated for representativeness of site conditions based on the review of method blank sample results. Completeness and comparability were evaluated based on the analytical testing methods, holding times, and reporting limits for the samples analyzed.

Precision and Accuracy

The precision and accuracy results were within the laboratory established control limits with the following exceptions:

- The recovery of TPH-e in the matrix spike associated with the water samples from wells MW-211, MW-137, MW-139, and MW-6B2 were low, (46 percent as compared to an acceptable lower limit of 50 percent). However, qualification of the data was not necessary because the corresponding MSD and LCS/LCSD data were within acceptable limits.

- The TPH-e surrogate recovery for sample GP-48-4.5' was 217 percent, which is above the upper control limit of 150 percent. There was a detectable concentration of TPH-e in this sample. However, the result was

not qualified because the laboratory indicated that the recovery was due to peak coelution.

- The TPH-e surrogate recovery for sample GP-48-14.5' was not reported since the detected concentrations were so high in the sample that it warranted dilution and the surrogate was diluted out.

- The TPH-e recoveries for the MS/MSD sample associated with GP-48-4.5' were not reported because the sample concentration was significantly higher that the spiking concentration. LCS/LCSD are typically used as indicators of precision and accuracy when this problem occurs. The TPH-e result for GP-48-4.5' is acceptable without qualification because the applicable LCS/LCSD dad had acceptable recoveries and RPDs.

- The lead MS/MSD recoveries associated with sample GP-48-4.5' were 80 and 1,220 percent respectively. A second spike of the MSD was done at the instrument and resulted in a recovery of 101 percent. Lead results for GP-48-4.5 are acceptable without qualification because the reanalyzed MSD sample had an acceptable recovery.

- The MSD for mercury in sample GP-48-4.5' had a recovery of 70 percent which was below the lower control limit of 75 percent. The corresponding MS sample had a recovery of 100 percent. A second spike of the sample was done at the instrument and resulted in a recovery of 94 percent. Mercury results for the GP-48-4.5' sample are acceptable without qualification because the reanalyzed MSD sample had an acceptable recovery.

- SVOCs detected in sample GP-48-14.5' were quantitated via dilution. Sample dilution also diluted surrogate results below the reporting limit.

- The TPH-e surrogate recovery for sample GP-50-2.5' was low (12 percent) due to sample dilution. No qualification of the results are necessary.

- The MS recovery for TPH-e in sample GP-44-3.5' was 48 percent, slightly outside the control limits of 50-150 percent. The associated MSD had an acceptable recovery of 79 percent and an acceptable RPD. Since the MSD and LCS/LCSD were all acceptable, data qualification was not necessary.

Data were not qualified in cases where the surrogate recoveries were outside the control limits as a result of 1) matrix interference caused by the presence of target or nontarget compounds, 2) sample extract dilution, or 3) when the recovery was greater than the upper control limit and the sample results were not detected for target compounds.

Representativeness

Representativeness is considered excellent as there were no results reported at concentrations greater than the reporting limits for the method blank samples. The lack of equipment rinsate blank samples does not affect sample representativeness in this case, because disposable bailers were used to collect groundwater samples.

Completeness and Comparability

The laboratory used standard EPA methodology, reporting limits, and instrumentation to maintain comparability with future data collection activities. Appropriate methods were utilized for all parameters with the exception of the initial analysis of PCBs. PCBs were initially analyzed by gas chromatography/mass spectrometer (GC/MS) EPA Method 8270. This method is not normally (and was not by Sequoia) calibrated for PCBs. The GC/MS has an extensive library of ion chromatograms for over 70,000 compounds, but can only give a qualitative indication of their presence in a sample. The samples were screened using this library to give a preliminary assessment of presence or absence of PCBs. The more appropriate analysis for PCBs is EPA Method 8080 by GC. This situation was not discovered until after the 14 day extraction holding time had passed. The soil samples were re-extracted, and analyzed for PCBs since these compounds are very persistent in the environment and are not expected to volatilize or transform. The sample results (both detected and not detected) are qualified as estimated with a low bias since the samples were analyzed outside of holding times, but the impacts on the data are minimal. The affected samples are listed below. The laboratory included sample chromatograms for TPH analyses allowing for future comparisons of fuel patterns.

Summary of Data Reliability

An evaluation of the precision, accuracy, representativeness, comparability, and completeness of the data generated from the IWS 6C investigation was performed for each method. All data are of known and acceptable quality as qualified based on the laboratory-established control limits and the data quality objectives.

SUMMARY

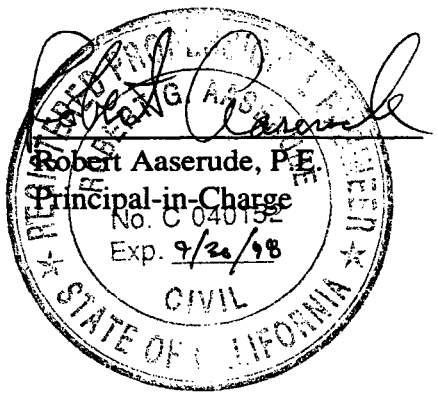
This letter addendum supplements the "Results of Additional Investigation and Remediation Plan - Inactive Waste Site 6C" report dated August 1, 1997 (Montgomery Watson, 1997). The results of additional chemical testing for PCBs and the QA/QC review do not impact the conclusions and/or recommendations included in the original report; Montgomery Watson continues to recommend periodic, manual free-phase liquid hydrocarbon (FPLH) removal from well MW-138 and quarterly groundwater sampling from monitoring wells MW-137, MW-139, MW-211, and MW-6B2; active remediation is not recommended for IWS 6C because the expected mobility of the compounds in the fill is low and the hydrocarbon content is subject to natural attenuation. Please contact either of the undersigned at 510.975.3400 if there are any questions regarding the information presented herein.

Sincerely,

//Original Signed By //

Andrew Kerr
Senior Hydrogeologist

Robert Aaserude, P.E.
Principal-in-Charge



cc:
Steve Mitchell - Tosco Refining Company, SFAR at Rodeo
Austin Bond (MW)

Enclosures (3)

References

Montgomery Watson, 1997. *Results of Additional Investigation And Remediation Plan - Inactive Waste Site 6C*, Tosco Refining Company, Rodeo Refinery, August 1, 1997.

TABLE 1

REVISED SUMMARY OF SOIL CHEMISTRY DATA FROM GEOPROBE BORINGS
TOSCO REFINING COMPANY - SAN FRANCISCO AREA REFINERY AT RODEO

Geoprobe Boring	Sample	TPH-e Concentration (mg/kg)	TPH-e Pattern	PAHs (mg/kg)	PCBs (ug/kg)	Lead (mg/kg)	Mercury (mg/kg)
GP-40	GP-40-3.5'	ND (1.0)	-	ND (0.25 - 0.50)	***ND (20 - 80) (a)***	7.0	0.028
GP-42	GP-42-15.5'	ND (1.0)	-	ND (0.25 - 0.50)	***ND (20 - 80) (a)***	4.1	0.012
GP-43	GP-43-7.5'	ND (1.0)	-	ND (0.25 - 0.50)	***ND (20 - 80) (a)***	4.3	ND (0.010)
GP-44	GP-44-3.5'	ND (1.0)	-	ND (0.25 - 0.50)	***ND (20 - 80) (a)***	6.5	0.049
GP-45	GP-45-3.5'	13	Diesel and unidentified hydrocarbons >C20	ND (0.25 - 0.50)	***ND (20 - 80) (a)***	14	0.014
	GP-45-7.5'	2.2	Unidentified hydrocarbons >C16	ND (0.25 - 0.50)	***ND (20 - 80) (a)***	11	0.029
	GP-45-11'	ND (1.0)	-	ND (0.25 - 0.50)	***ND (20 - 80) (a)***	4.5	0.015
GP-46	GP-46-3.5'	ND (1.0)	-	ND (0.25 - 0.50)	***ND (20 - 80) (a)***	6.9	0.072
	GP-46-7.5'	ND (1.0)	-	ND (0.25 - 0.50)	***ND (20 - 80) (a)***	5.4	0.015
GP-47	GP-47-7.5'	200	Diesel and unidentified hydrocarbons >C20	benzo(a)anthracene: 0.76 benzo(b)fluoranthene: 0.70 benzo(a)pyrene: 0.69 chrysene: 1.2	ND (20 - 80) (a)	26	0.057
	GP-47-13.5'	ND (1.0)	-	ND (0.25 - 0.50)	***ND (20 - 80) (a)***	5.0	0.026
	GP-47-21.5'	ND (1.0)	-	ND (0.25 - 0.50)	***ND (20 - 80) (a)***	4.0	ND (0.010)
GP-48	GP-48-4.5'	240	Diesel and unidentified hydrocarbons >C20	ND (0.25 - 0.50)	ND (20 - 80) (a)	190	0.30

TABLE 1

REVISED SUMMARY OF SOIL CHEMISTRY DATA FROM GEOPROBE BORINGS
TOSCO REFINING COMPANY - SAN FRANCISCO AREA REFINERY AT RODEO

Geoprobe Boring	Sample	TPH-e Concentration (mg/kg)	TPH-e Pattern	PAHs (mg/kg)	PCBs (ug/kg)	Lead (mg/kg)	Mercury (mg/kg)
GP-48 (contd.)	GP-48-14.5'	6,500	Diesel and unidentified hydrocarbons >C20	benzo(a)anthracene: 33 benzo(b)fluoranthene: 24 benzo(a)pyrene: 24 chrysene: 46 phenanthrene: 19 pyrene: 14	PCB 1254: 82 (a)	17	0.59
GP-49	GP-49-3.5'	23	Diesel and unidentified hydrocarbons >C20	ND (0.25 - 0.50)	***ND (20 - 80) (a)***	170	0.11
	GP-49-7.5'	ND (1.0)	-	ND (0.25 - 0.50)	***ND (20 - 80) (a)***	5.3	0.019
GP-50	GP-50-2.5'	67	Unidentified hydrocarbons >C18	ND (1.3 - 2.5)	ND (20 - 80) (a)	170	0.66
GP-51	GP-51-3.5'	200	Diesel and unidentified hydrocarbons >C20	chrysene: 1.5	ND (20 - 80) (a)	14	0.088
	GP-51-11'	6.1	Unidentified hydrocarbons >C15	ND (0.25 - 0.50)	***ND (20 - 80) (a)***	6.5	0.066
	GP-51-13.5'	ND (1.0)	-	ND (0.25 - 0.50)	***ND (20 - 80) (a)***	3.4	0.095
	Method:	*3550 / 8015m*		*8270*	*8080*	*7420*	*7471*

TPH-e - extractable total petroleum hydrocarbons
mg/kg - milligrams per kilogram
ND - Not detected equal to or greater than method reporting limit shown in parenthesis.

PAHs - polynuclear aromatic hydrocarbons
PCBs - polychlorinated biphenols
µg/kg - micrograms per kilogram

(a) Data qualified as estimated with a low bias due to analysis outside method holding time.

TABLE 2

SUMMARY OF GROUNDWATER CHEMISTRY DATA
TOSCO REFINING COMPANY - SAN FRANCISCO AREA REFINERY AT RODEO

Well	TPH-e Concentration (µg/L)	TPH-e Pattern	Benzene (µg/L)	Toluene (µg/L)	Ethyl-Benzene (µg/L)	Total Xylenes (µg/L)	PAHs (µg/L)	PCBs (a) (µg/L)	Lead (µg/L)	Mercury (µg/L)
MW-137	1,200	diesel and unidentified hydrocarbons <C15	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	2-methylnaphthalene (10) all other compds. ND (5.0 - 10)	*ND (0.50 - 2.0)*	7.8	ND (2.0)
MW-139	ND (50)	-	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (5.0 - 10))	*ND (0.50 - 2.0)*	ND (2.0)	ND (2.0)
MW-211	ND (50)	-	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (5.0 - 10))	*ND (0.50 - 2.0)*	ND (2.0)	ND (2.0)
MW-6B2	ND (50)	-	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (5.0 - 10))	*ND (0.50 - 2.0)*	ND (2.0)	ND (2.0)
	3510 / 8015m		*5030/ 8020*	*5030/ 8020*	*5030/ 8020*	*5030/ 8020*	*8270*	*8080*	*7421*	*7470*

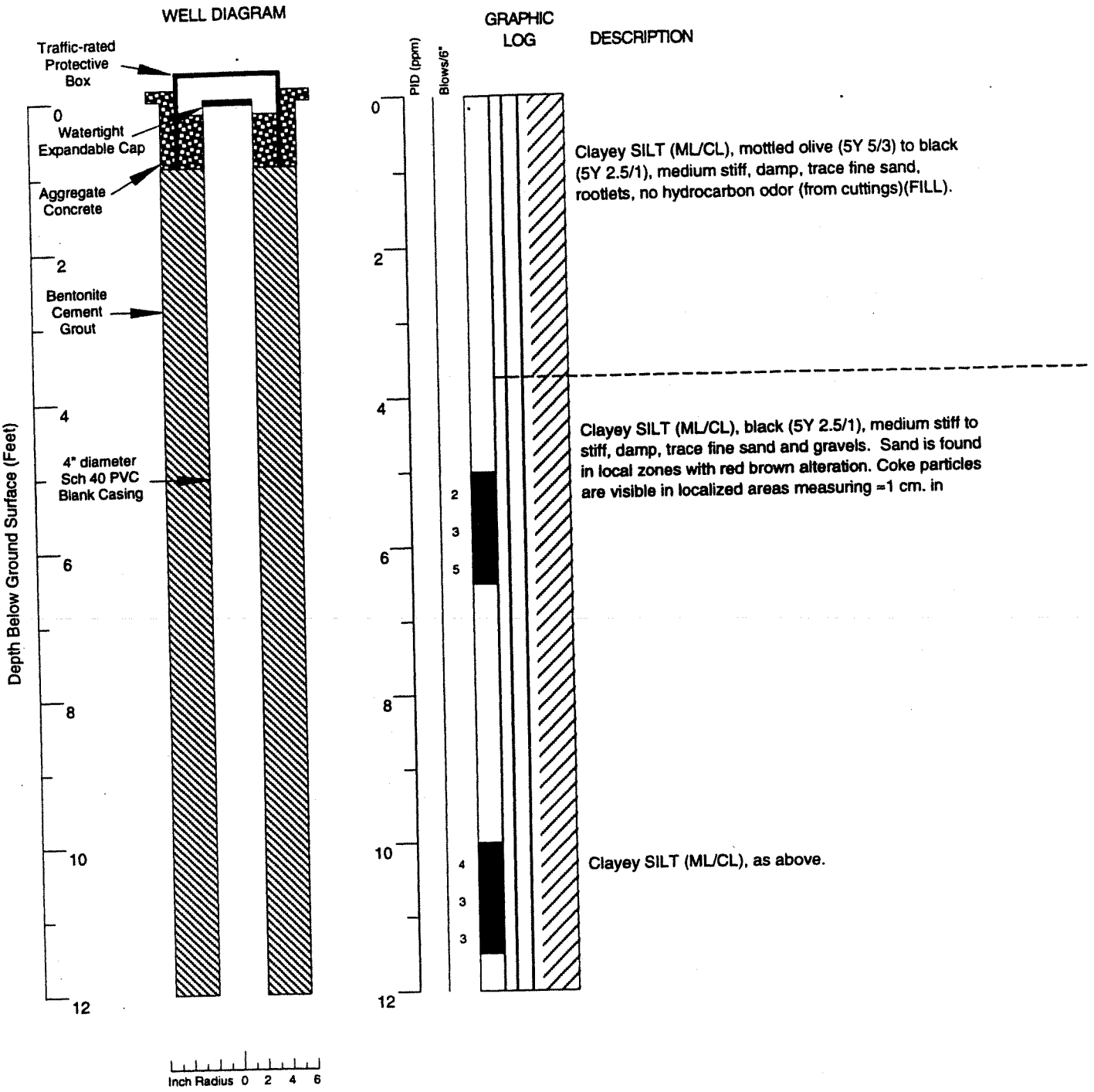
TPH -e - extractable total petroleum hydrocarbons
mg/L- milligrams per liter
ND - Not detected equal to or greater than method reporting limit shown in parenthesis.
PAHs - polynuclear aromatic hydrocarbons
PAHs - polynuclear aromatic hydrocarbons
µg/L - micrograms per liter

PCBs - polychlorinated biphenols. PCBs tested include PCB 1016, 1221, 1232, 1242, 1248, 1254, and 1260.

(a) samples collected during Summer 1997 Refinery Groundwater Monitoring Program, August 6, 1997

Attachment 1

Soil Boring and Well Completion Logs
(Geoprobe borings GP-40 through GP-51, and well MW-211)



Geologist:	Andrew Kerr	Drilling Company:	Gregg Drilling and Testing, Inc.	Well-head Completion:	Flush-mounted Christie Box w/ Traffic Rated Steel Lid
Project Mgr:	Lance Larsen	Drilling Method:	Hollow Stem Auger	Type of Sampler:	18" CA Split Spoon Sampler
Dates Drilled:	7/1-3/97	Driller:	Trevor Joyner/Mike Minihan	TD (Total Depth):	28.0 ft. below ground surface
Date Installed:	7/3/97	Drill Rig:	Mobile B-61	Top of Casing:	59.82 ft. MSL
Checked by:	J.Ross Wagner, Ph.D., R.G.				

EXPLANATION

- Water level during drilling
- Water level in completed well
- Location of recovered core sample
- Location of sample sealed and chemically tested
- Contacts: Solid where certain
- Dotted where approximate
- Dashed where uncertain
- NR No recovery

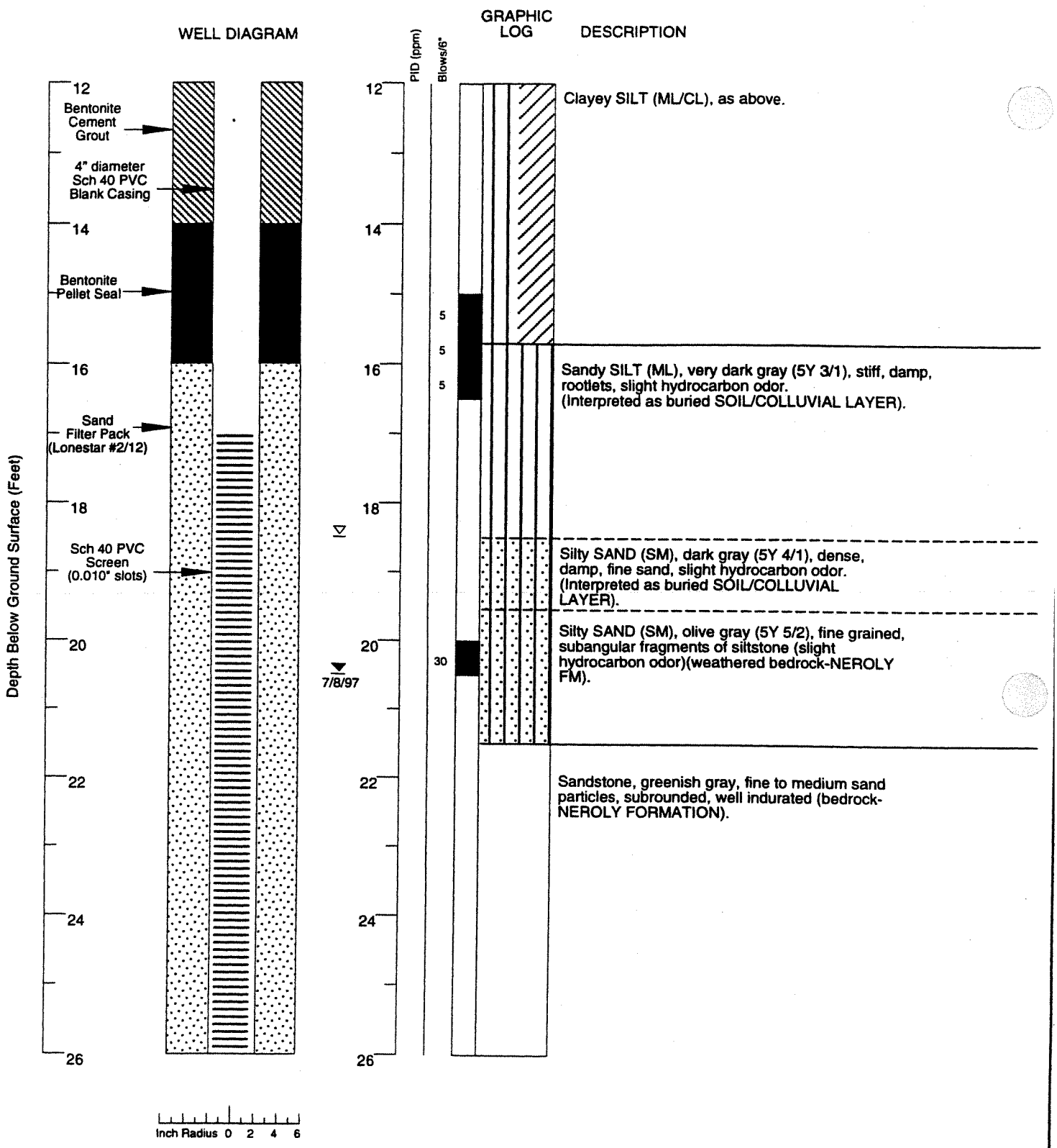
07/97.TR

MONTGOMERY WATSON

Boring Log and Well Construction Details
MW-211
Tosco Refining Company
San Francisco Area Refinery at Rodeo
Rodeo, CA

MONITORING WELL

MW-211



EXPLANATION

- Water level during drilling
- Water level in completed well
- Location of recovered core sample
- Location of sample sealed and chemically tested

Contacts:
- Solid where certain
- Dotted where approximate
- Dashed where uncertain

NR No recovery

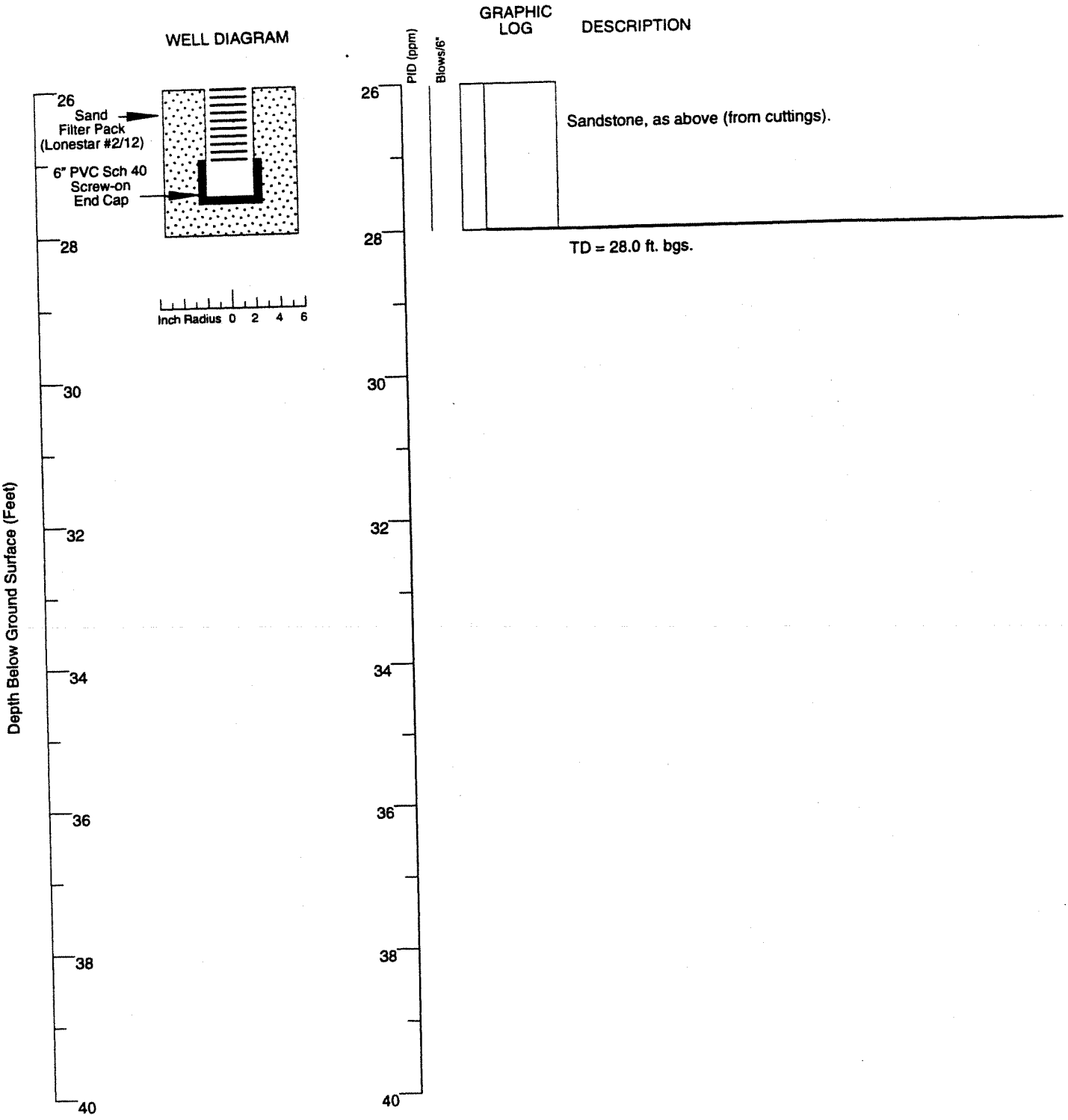
07/97 TR

MONTGOMERY WATSON

Boring Log and Well Construction Details
MW-211
Tosco Refining Company
Rodeo Refinery, Rodeo, CA

MONITORING WELL

MW-211



EXPLANATION

- Water level during drilling
- Water level in completed well
- Location of recovered core sample
- Location of sample sealed and chemically tested

Contacts:
- Solid where certain
- Dotted where approximate
- Dashed where uncertain
- NR No recovery

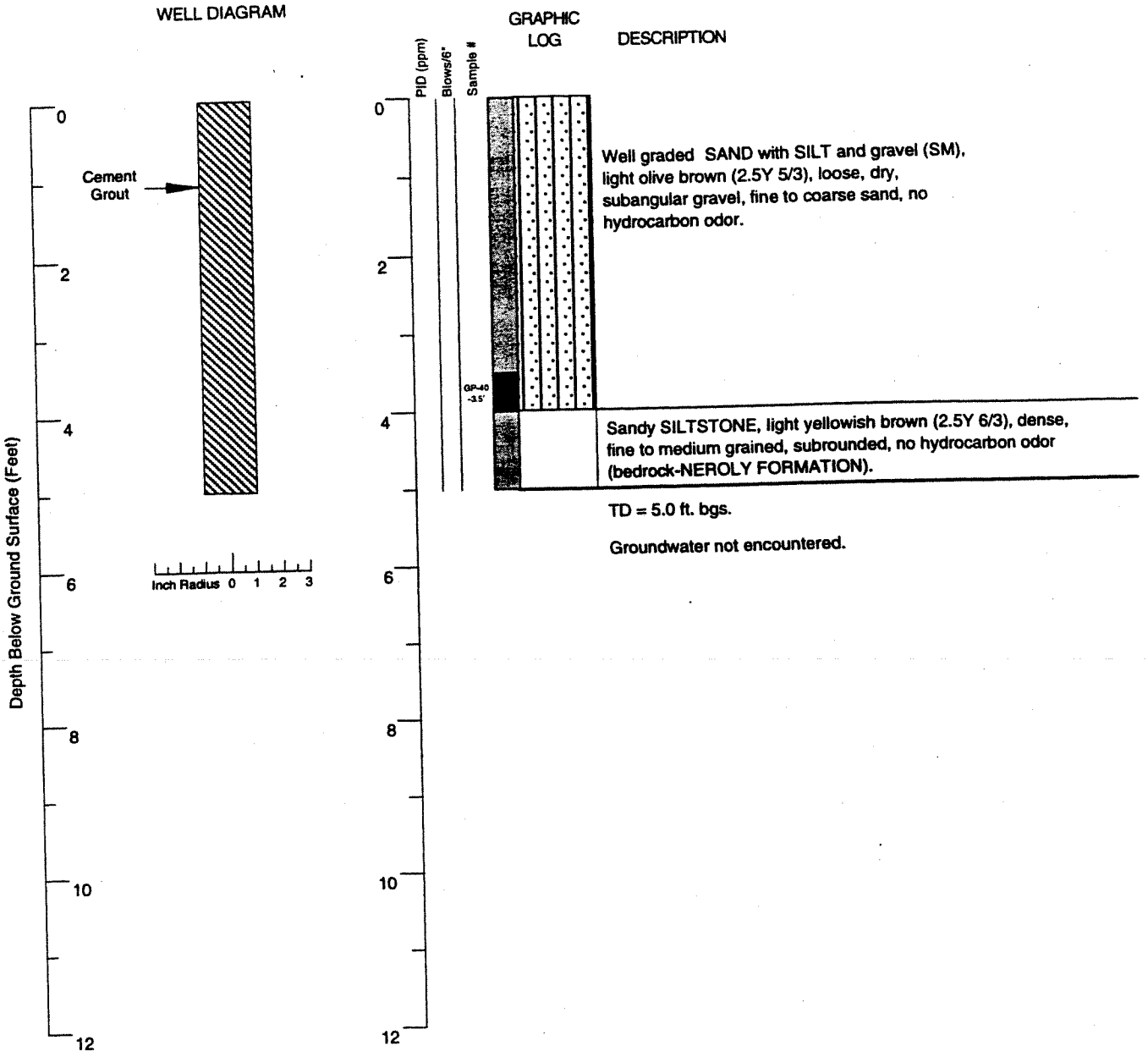
07/97.TR

MONTGOMERY WATSON

Boring Log and Well Construction Details
MW-211
Tosco Refining Company
San Francisco Area Refinery at Rodeo
Rodeo, CA

MONITORING WELL

MW-211



Geologist:	Andrew Kerr	Drilling Company:	Gregg Drilling and Testing, Inc.	Type of Sampler:	1.5" Macro Core
Project Mgr:	Lance Larsen	Drilling Method:	Hydraulic Coring/Direct Push	TD (Total Depth):	5.0 ft. below ground surface
Dates Drilled:	6/25/97	Driller:	Morris Ruud		
Checked by:	J.Ross Wagner, Ph.D., R.G.	Drill Rig:	Geoprobe 5400		

EXPLANATION

- ▽ Water level during drilling
- ▼ Water level in completed well
- ■ Location of recovered core sample
- ■ Location of sample sealed and chemically tested

Contacts:
- ——— Solid where certain
- ..... Dotted where approximate
- – – – Dashed where uncertain

NR No recovery

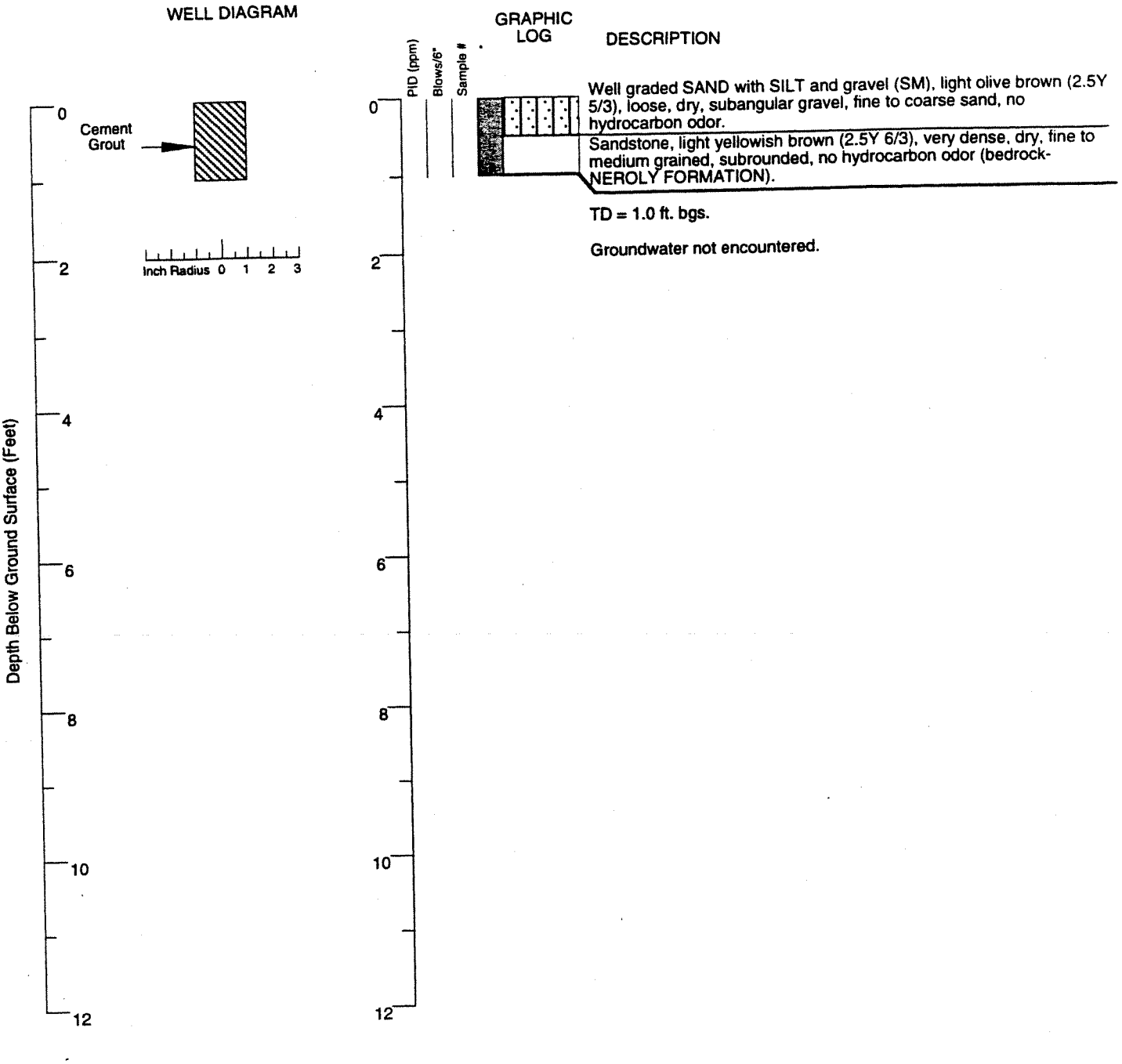
07/97.TB

MONTGOMERY WATSON

Boring Log
GP-40
Tosco Refining Company
San Francisco Area Refinery at Rodeo
Rodeo, CA

SOIL BORING

GP-40



Geologist:	Andrew Kerr	Drilling Company:	Gregg Drilling and Testing, Inc.	Type of Sampler:	1.5" Macro Core
Project Mgr:	Lance Larsen	Drilling Method:	Hydraulic Coring/Direct Push	TD (Total Depth):	1.0 ft. below ground surface
Dates Drilled:	6/25/97	Driller:	Morris Ruud		
Checked by:	J.Ross Wagner, Ph.D., R.G.	Drill Rig:	Geoprobe 5400		

EXPLANATION

- ▽ Water level during drilling
- ▼ Water level in completed well
- ■ Location of recovered core sample
- ■ Location of sample sealed and chemically tested

Contacts:
- ——— Solid where certain
- ..... Dotted where approximate
- – – – Dashed where uncertain

NR No recovery

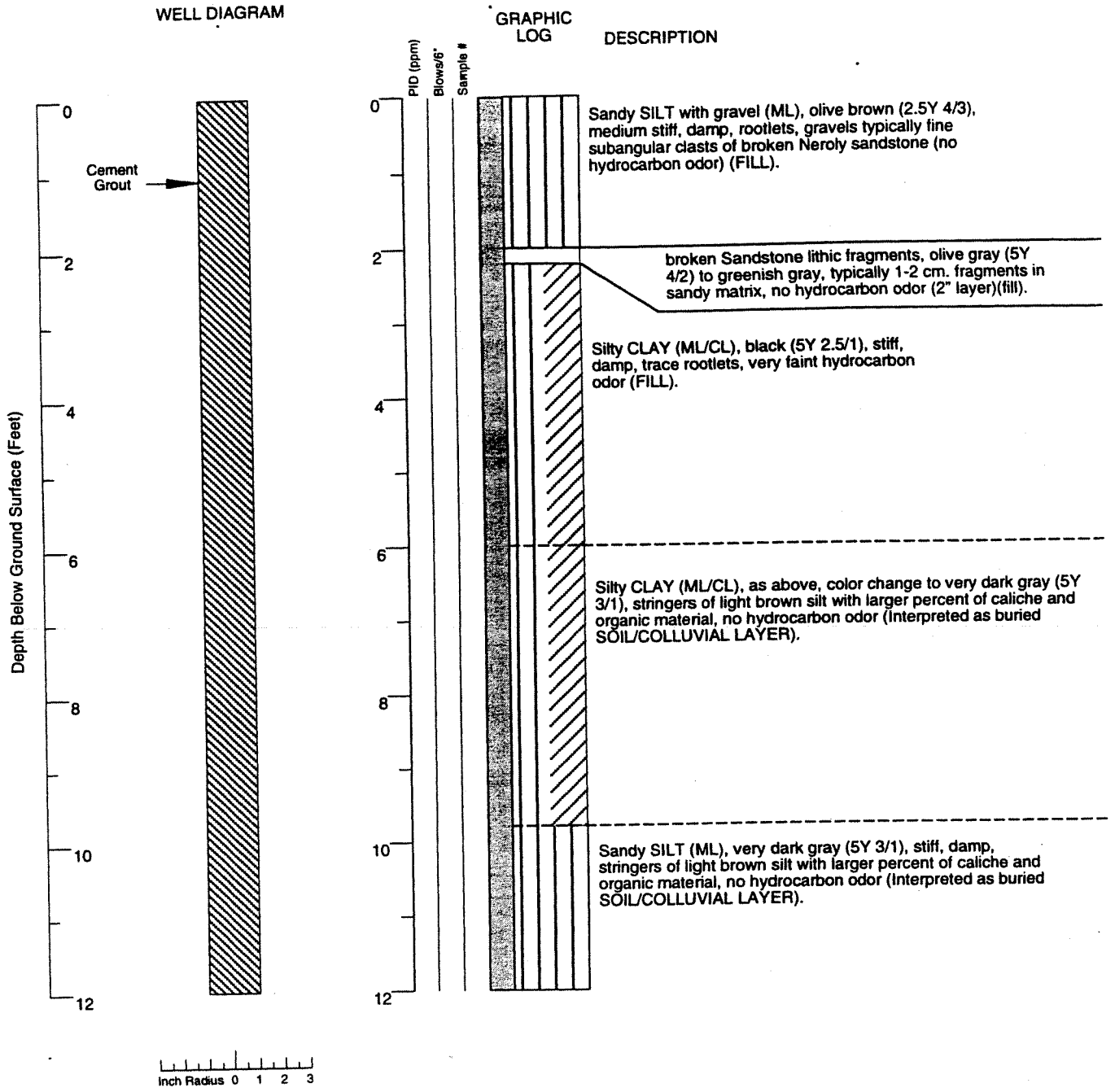
07/97.TR

MONTGOMERY WATSON

Boring Log
GP-41
Tosco Refining Company
San Francisco Area Refinery at Rodeo
Rodeo, CA

SOIL BORING

GP-41



Geologist:	Andrew Kerr	Drilling Company:	Gregg Drilling and Testing, Inc.	Type of Sampler:	1.5" Macro Core
Project Mgr:	Lance Larsen	Drilling Method:	Hydraulic Coring/Direct Push	TD (Total Depth):	18.0 ft. below ground surface
Dates Drilled:	6/26/97	Driller:	Morris Ruud		
Checked by:	J.Ross Wagner, Ph.D., R.G.	Drill Rig:	Geoprobe 5400		

EXPLANATION

- Water level during drilling
- Water level in completed well
- Location of recovered core sample
- Location of sample sealed and chemically tested

Contacts:
- Solid where certain
- Dotted where approximate
- Dashed where uncertain
- NR No recovery

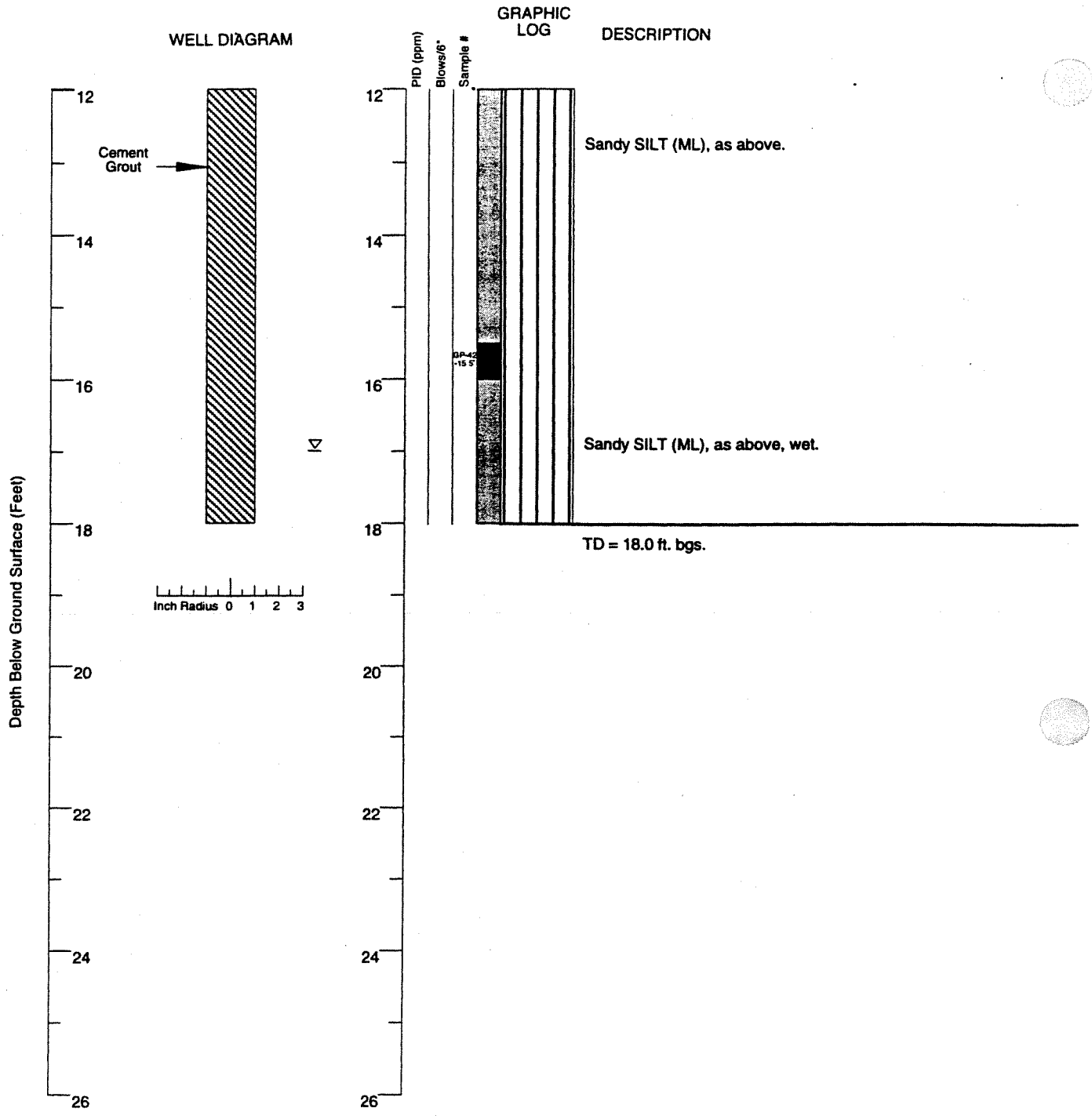
07/97.TR

MONTGOMERY WATSON

Boring Log
GP-42
Tosco Refining Company
San Francisco Area Refinery at Rodeo
Rodeo, CA

SOIL BORING

GP-42



EXPLANATION

- Water level during drilling
- Water level in completed well
- Location of recovered core sample
- Location of sample sealed and chemically tested

Contacts:
- Solid where certain
- Dotted where approximate
- Dashed where uncertain

NR No recovery

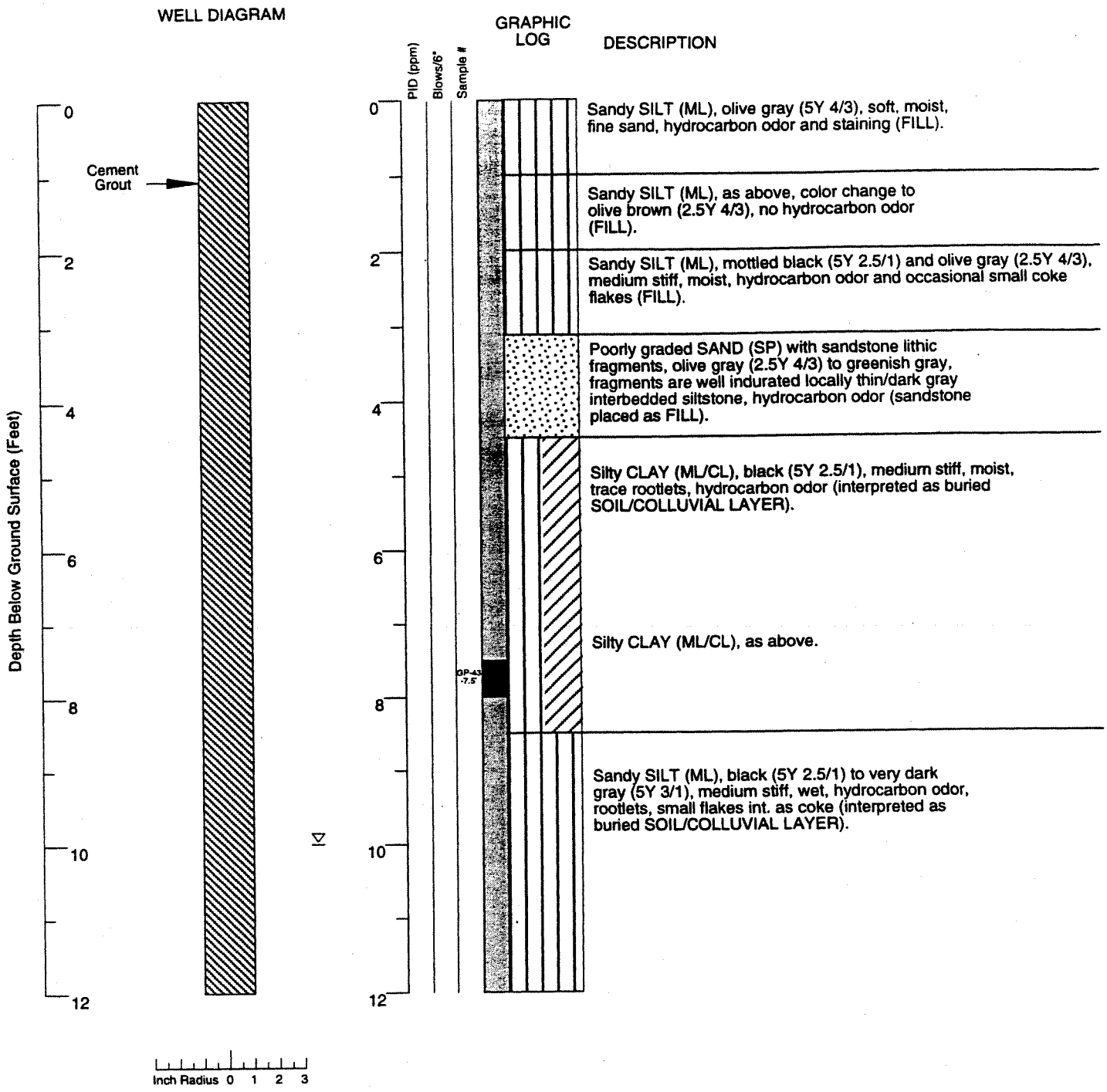
07/97.TR

MONTGOMERY WATSON

Boring Log
GP-42
Tosco Refining Company
San Francisco Area Refinery at Rodeo
Rodeo, CA

SOIL BORING

GP-



Geologist:	Andrew Kerr	Drilling Company:	Gregg Drilling and Testing, Inc.	Type of Sampler:	1.5" Macro Core
Project Mgr:	Lance Larsen	Drilling Method:	Hydraulic Coring/Direct Push	TD (Total Depth):	16.0 ft. below ground surface
Dates Drilled:	6/26/97	Driller:	Morris Ruud		
Checked by:	J.Ross Wagner, Ph.D., R.G.	Drill Rig:	Geoprobe 5400		

EXPLANATION

- ▽ Water level during drilling
- ▼ Water level in completed well
- ■ Location of recovered core sample
- ■ Location of sample sealed and chemically tested

Contacts:
- ——— Solid where certain
- ····· Dotted where approximate
- – – – Dashed where uncertain
- NR No recovery

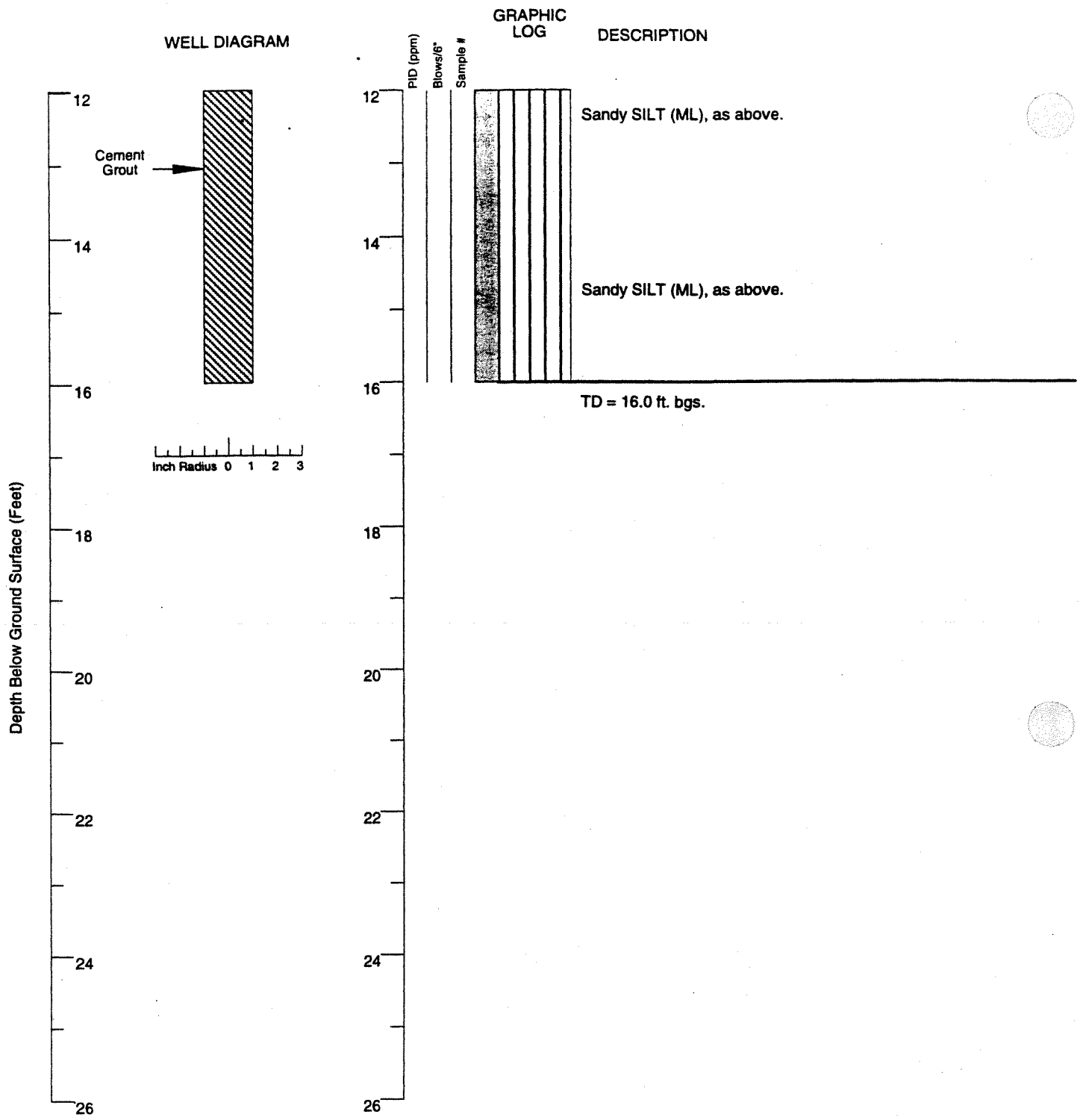
07/97.TR

MONTGOMERY WATSON

Boring Log
GP-43
Tosco Refining Company
San Francisco Area Refinery at Rodeo
Rodeo, CA

SOIL BORING

GP-43



EXPLANATION

- Water level during drilling
- Water level in completed well
- Location of recovered core sample
- Location of sample sealed and chemically tested

Contacts:
- Solid where certain
- Dotted where approximate
- Dashed where uncertain

NR No recovery

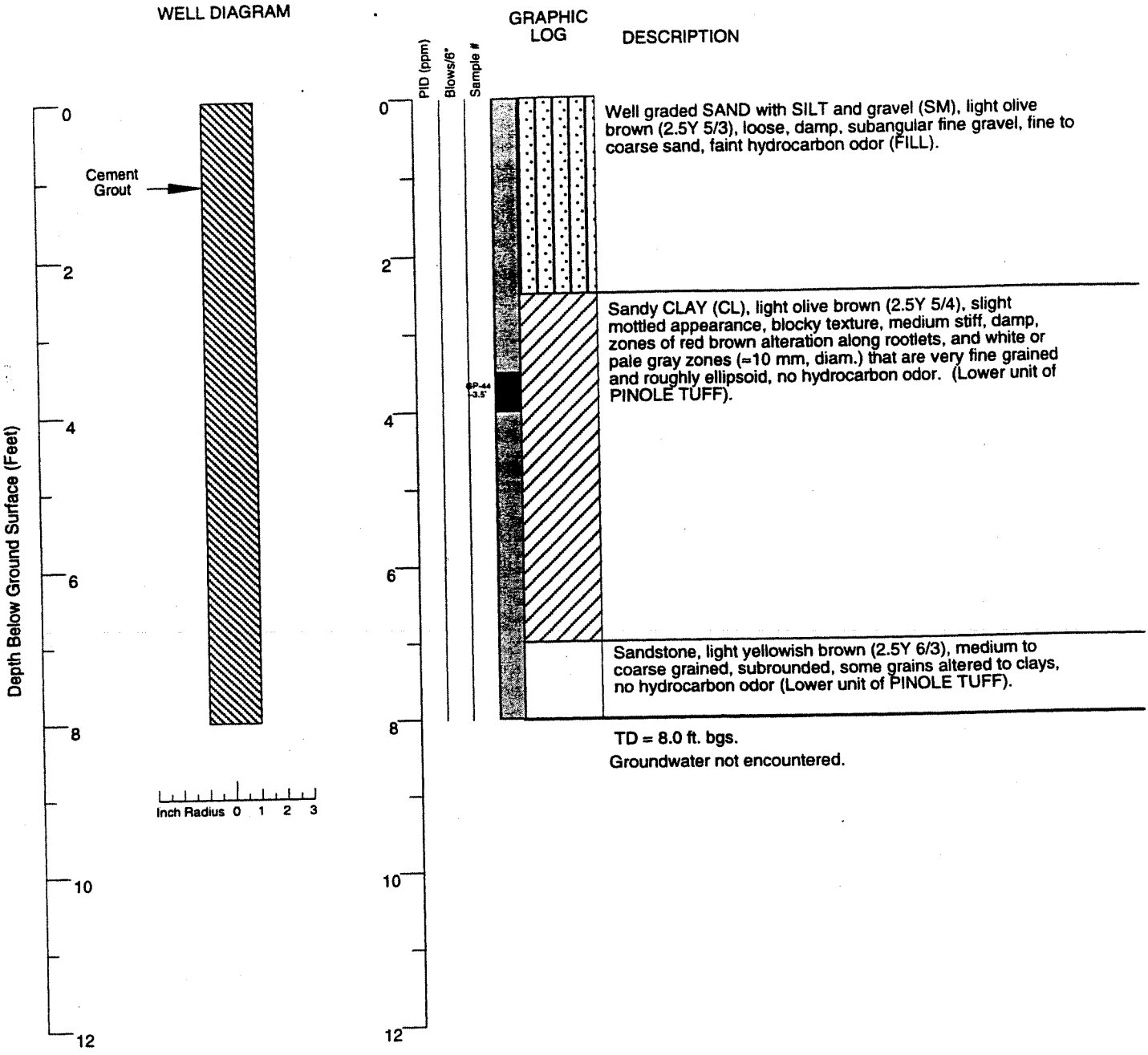
07/97.TR

MONTGOMERY WATSON

Boring Log
GP-43
Tosco Refining Company
San Francisco Area Refinery at Rodeo
Rodeo, CA

SOIL BORING

GP-43



Geologist:	Andrew Kerr	Drilling Company:	Gregg Drilling and Testing, Inc.	Type of Sampler:	1.5" Macro Core
Project Mgr:	Lance Larsen	Drilling Method:	Hydraulic Coring/Direct Push	TD (Total Depth):	8.0 ft. below ground surface
Dates Drilled:	6/26/97	Driller:	Morris Ruud		
Checked by:	J.Ross Wagner, Ph.D., R.G.	Drill Rig:	Geoprobe 5400		

EXPLANATION

- ▽ Water level during drilling
- ▼ Water level in completed well
- ■ Location of recovered core sample
- ■ Location of sample sealed and chemically tested

Contacts:
- ——— Solid where certain
- ..... Dotted where approximate
- – – – Dashed where uncertain

NR No recovery

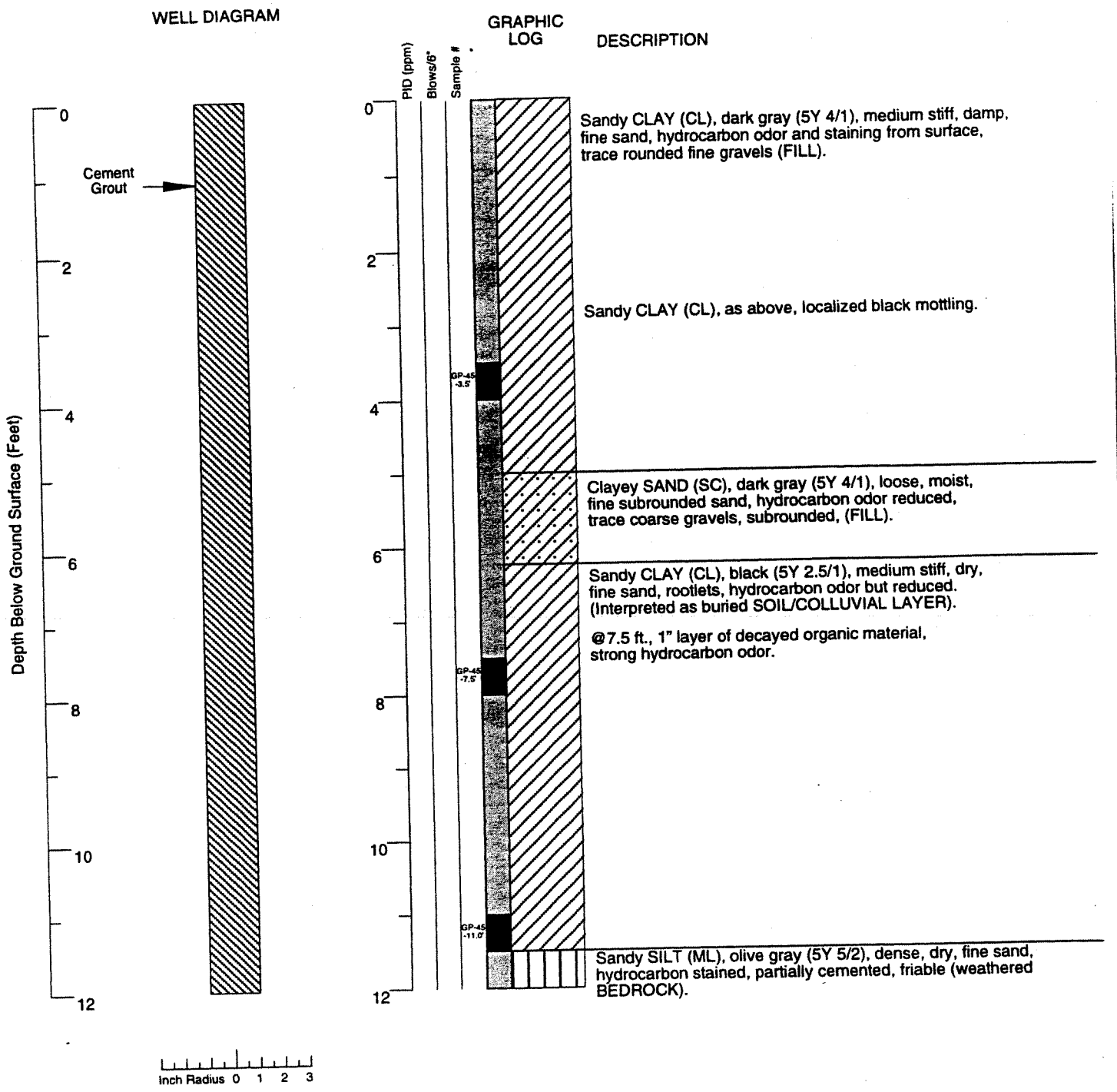
07/97.TR

MONTGOMERY WATSON

Boring Log
GP-44
Tosco Refining Company
San Francisco Area Refinery at Rodeo
Rodeo, CA

SOIL BORING

GP-44



Geologist:	Andrew Kerr	Drilling Company:	Gregg Drilling and Testing, Inc.	Type of Sampler:	1.5" Macro Core
Project Mgr:	Lance Larsen	Drilling Method:	Hydraulic Coring/Direct Push	TD (Total Depth):	13.0 ft. below ground surface
Dates Drilled:	6/25/97	Driller:	Morris Ruud		
Checked by:	J.Ross Wagner, Ph.D., R.G.	Drill Rig:	Geoprobe 5400		

EXPLANATION

- ▽ Water level during drilling
- ▼ Water level in completed well
- ■ Location of recovered core sample
- ■ Location of sample sealed and chemically tested

Contacts:
- ——— Solid where certain
- ..... Dotted where approximate
- – – – Dashed where uncertain
- NR No recovery

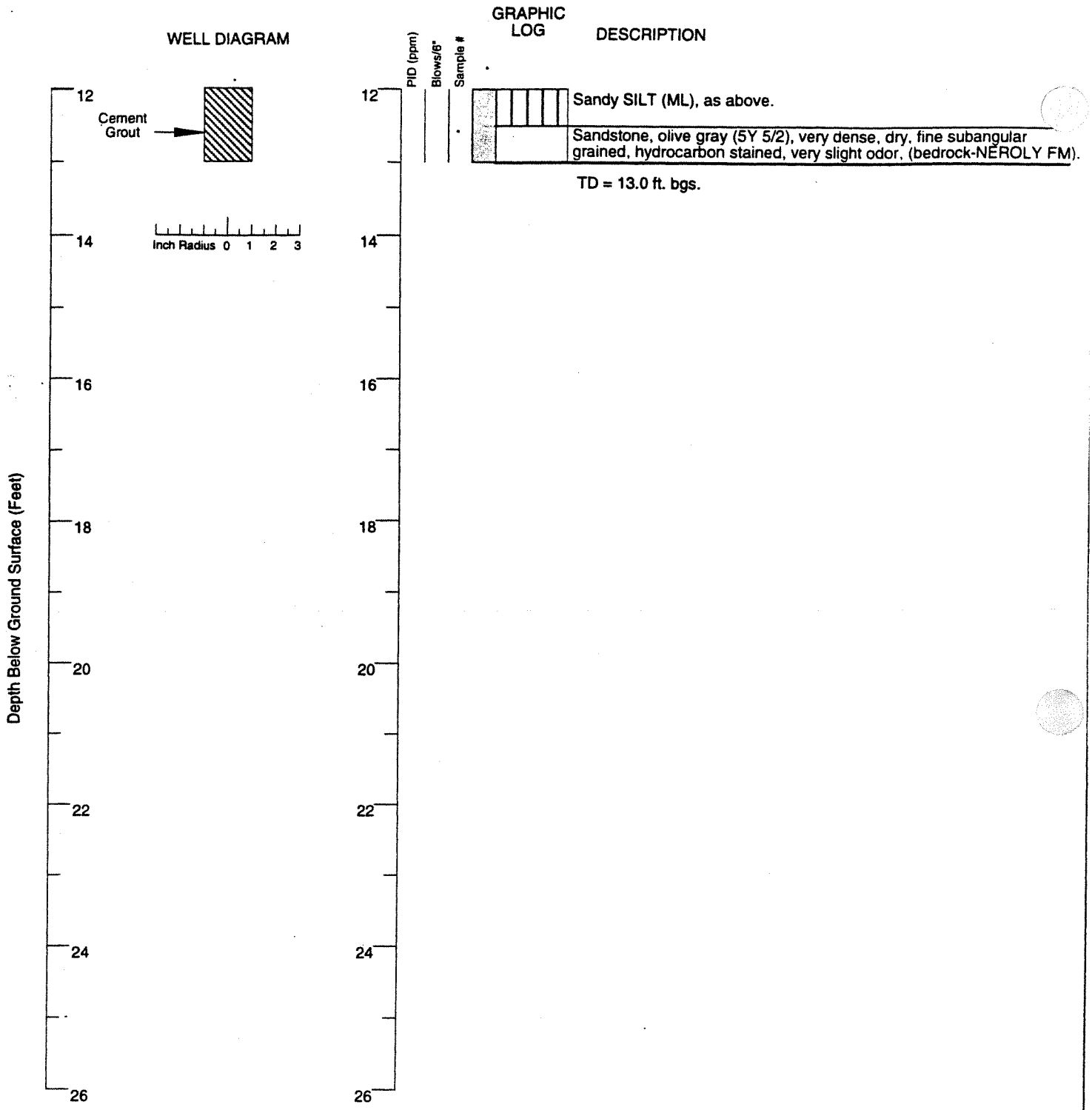
07/97.TR

MONTGOMERY WATSON

Boring Log
GP-45
Tosco Refining Company
San Francisco Area Refinery at Rodeo
Rodeo, CA

SOIL BORING

GP-45



EXPLANATION

- Water level during drilling
- Water level in completed well
- Location of recovered core sample
- Location of sample sealed and chemically tested

Contacts:
- Solid where certain
- Dotted where approximate
- Dashed where uncertain

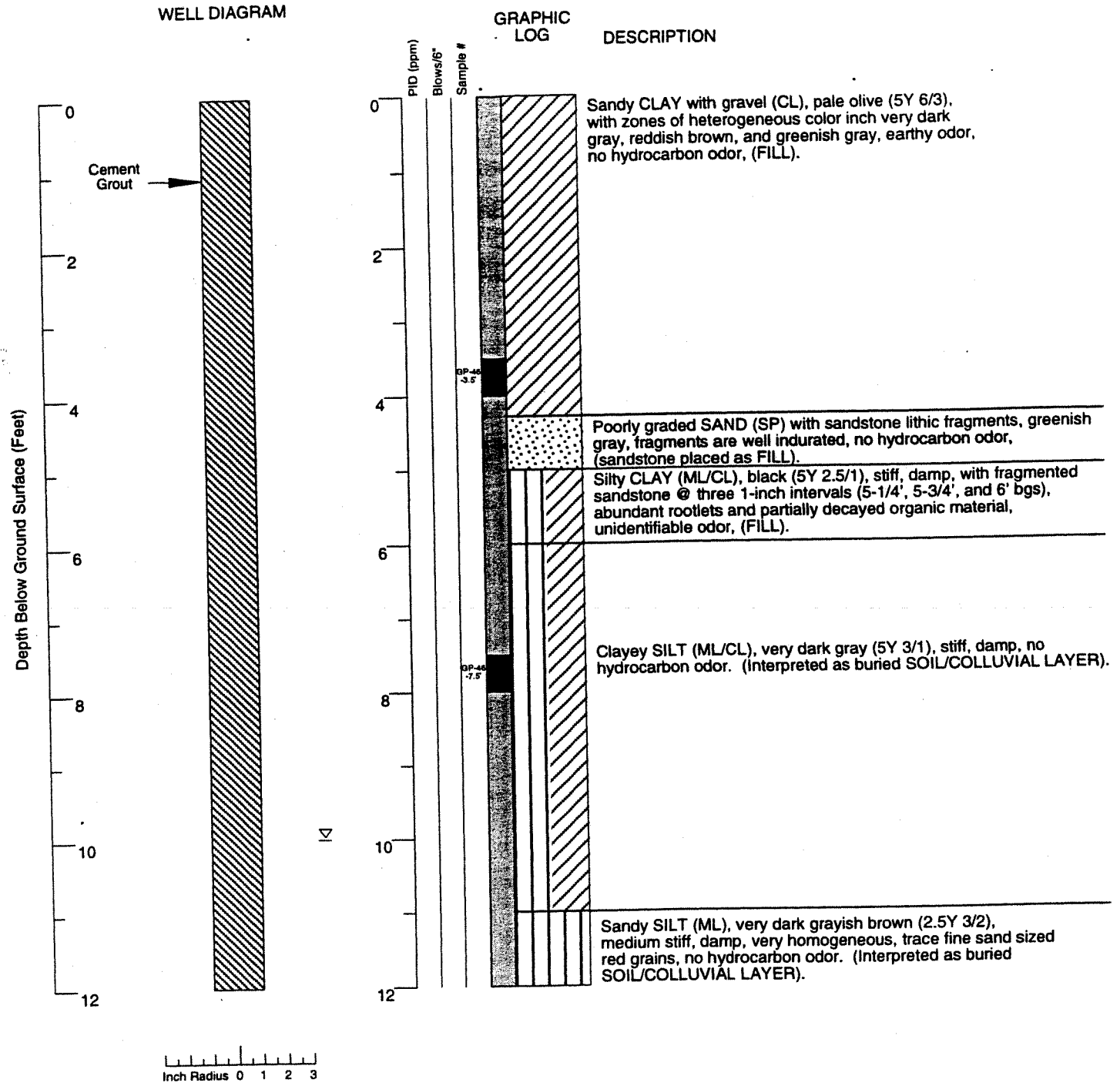
NR No recovery

MONTGOMERY WATSON

Boring Log
GP-45
Tosco Refining Company
San Francisco Area Refinery at Rodeo
Rodeo, CA

SOIL BORING

GP-45



Geologist:	Andrew Kerr	Drilling Company:	Gregg Drilling and Testing, Inc.	Type of Sampler:	1.5" Macro Core
Project Mgr:	Lance Larsen	Drilling Method:	Hydraulic Coring/Direct Push	TD (Total Depth):	14.5 ft. below ground surface
Dates Drilled:	6/26/97	Driller:	Morris Ruud		
Checked by:	J.Ross Wagner, Ph.D., R.G.	Drill Rig:	Geoprobe 5400		

EXPLANATION

- ▽ Water level during drilling
- ▼ Water level in completed well
- Location of recovered core sample
- Location of sample sealed and chemically tested
- Contacts: Solid where certain
- ..... Dotted where approximate
- – – – Dashed where uncertain
- NR No recovery

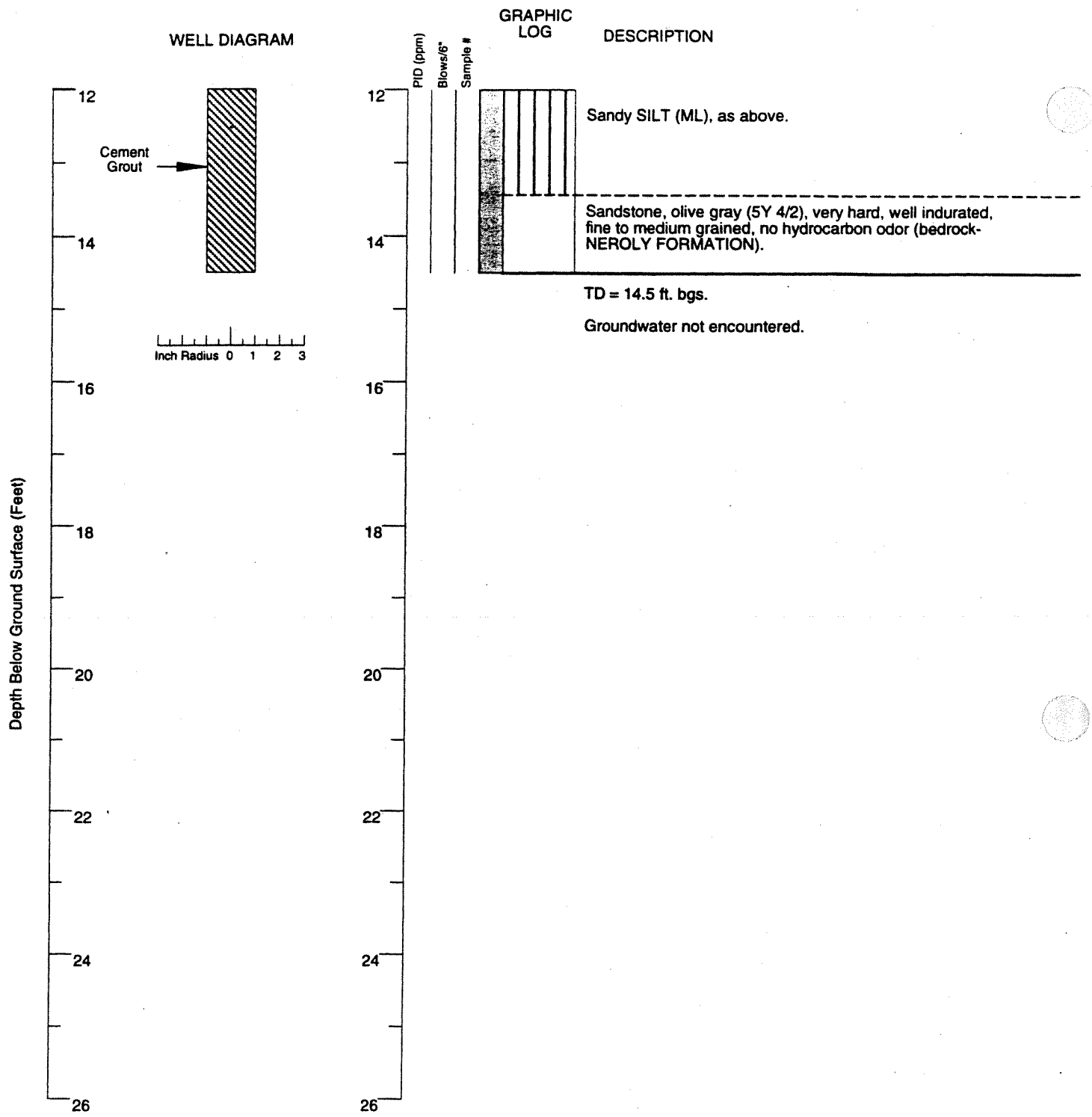
07/97.TR

MONTGOMERY WATSON

Boring Log
GP-46
Tosco Refining Company
San Francisco Area Refinery at Rodeo
Rodeo, CA

SOIL BORING

GP-46



EXPLANATION

- Water level during drilling
- Water level in completed well
- Location of recovered core sample
- Location of sample sealed and chemically tested

Contacts:
- Solid where certain
- Dotted where approximate
- Dashed where uncertain

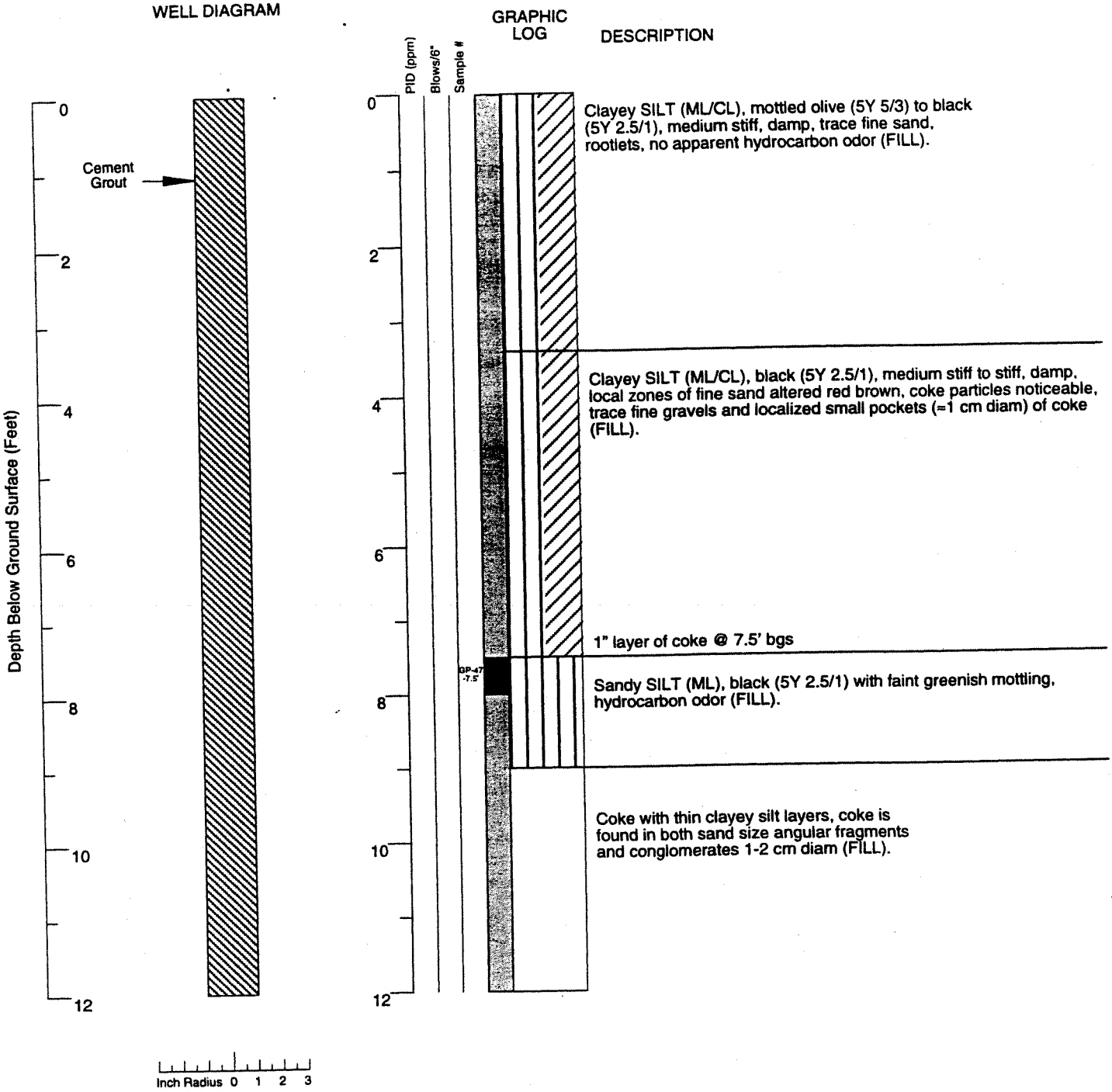
NR No recovery

MONTGOMERY WATSON

Boring Log
GP-46
Tosco Refining Company
San Francisco Area Refinery at Rodeo
Rodeo, CA

SOIL BORING

GP-46



Geologist:	Andrew Kerr	Drilling Company:	Gregg Drilling and Testing, Inc.	Type of Sampler:	1.5" Macro Core
Project Mgr:	Lance Larsen	Drilling Method:	Hydraulic Coring/Direct Push	TD (Total Depth):	22.5 ft. below ground surface
Dates Drilled:	6/26/97	Driller:	Morris Ruud		
Checked by:	J.Ross Wagner, Ph.D., R.G.	Drill Rig:	Geoprobe 5400		

EXPLANATION

- ▽ Water level during drilling
- ▼ Water level in completed well
- Location of recovered core sample
- Location of sample sealed and chemically tested

Contacts:
- ——— Solid where certain
- ..... Dotted where approximate
- – – – Dashed where uncertain

NR No recovery

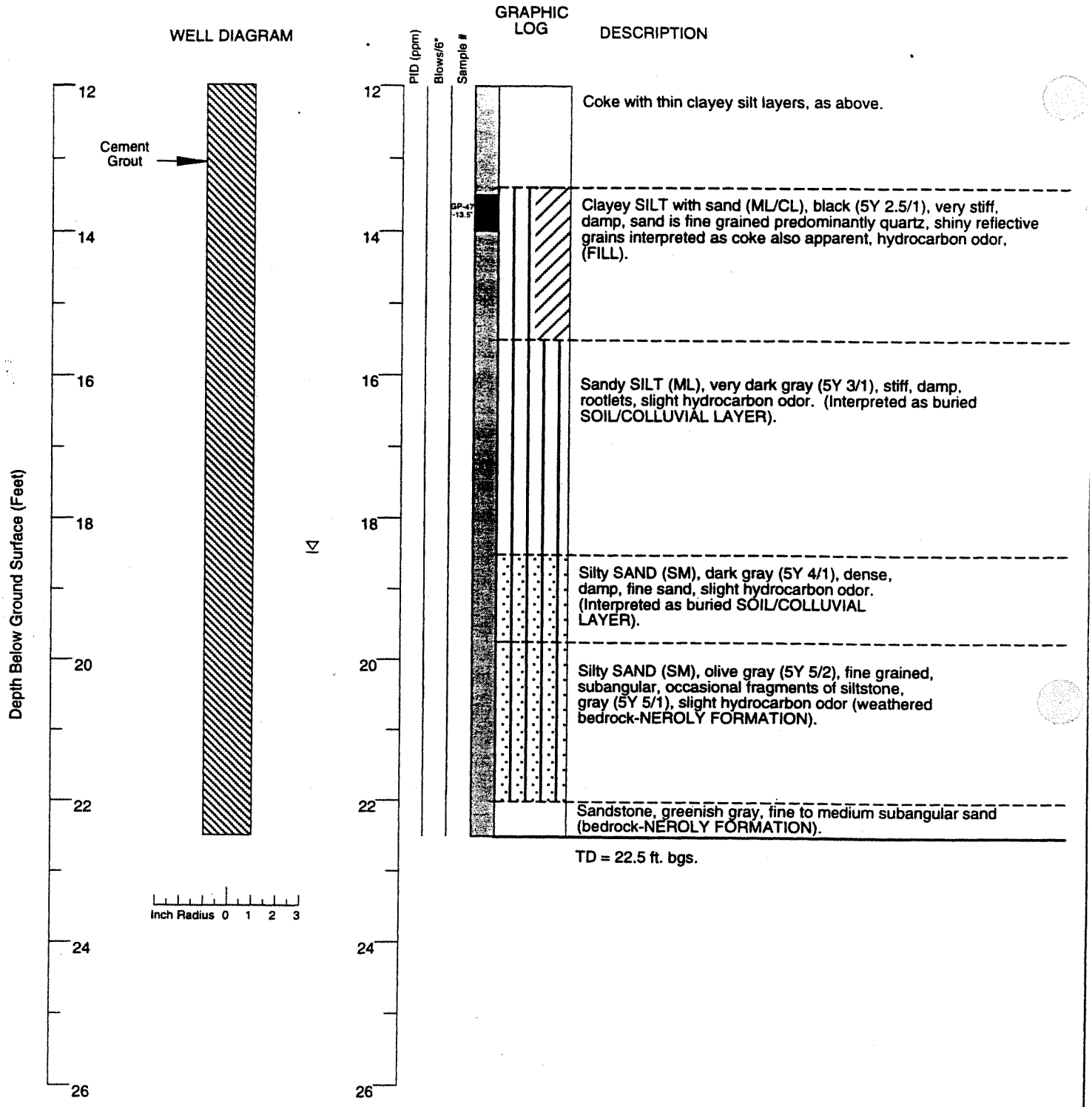
07/97.TR

MONTGOMERY WATSON

Boring Log
GP-47
Tosco Refining Company
San Francisco Area Refinery at Rodeo
Rodeo, CA

SOIL BORING

GP-47



EXPLANATION

- Water level during drilling
- Water level in completed well
- Location of recovered core sample
- Location of sample sealed and chemically tested

Contacts:
- Solid where certain
- Dotted where approximate
- Dashed where uncertain

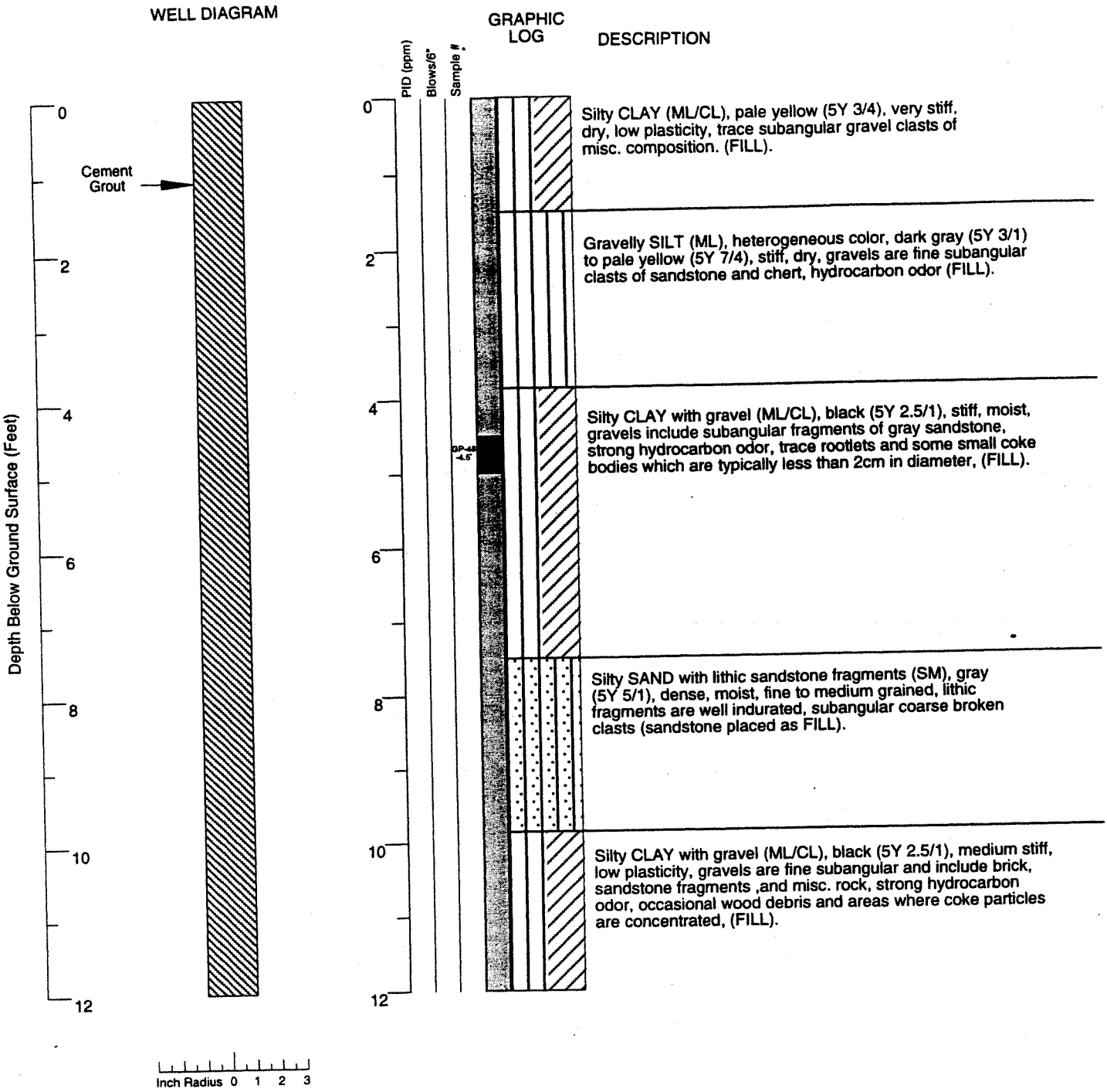
NR No recovery

MONTGOMERY WATSON

Boring Log
GP-47
Tosco Refining Company
San Francisco Area Refinery at Rodeo
Rodeo, CA

SOIL BORING

GP-47



Geologist:	Andrew Kerr	Drilling Company:	Gregg Drilling and Testing, Inc.	Type of Sampler:	1.5" Macro Core
Project Mgr:	Lance Larsen	Drilling Method:	Hydraulic Coring/Direct Push	TD (Total Depth):	23.0 ft. below ground surface
Dates Drilled:	7/3/97	Driller:	Morris Ruud		
Checked by:	J.Ross Wagner, Ph.D., R.G.	Drill Rig:	Geoprobe 5400		

EXPLANATION

- ▽ Water level during drilling
- ▼ Water level in completed well
- ■ Location of recovered core sample
- ■ Location of sample sealed and chemically tested
- Contacts: Solid where certain
- ..... Dotted where approximate
- – – – Dashed where uncertain
- NR No recovery

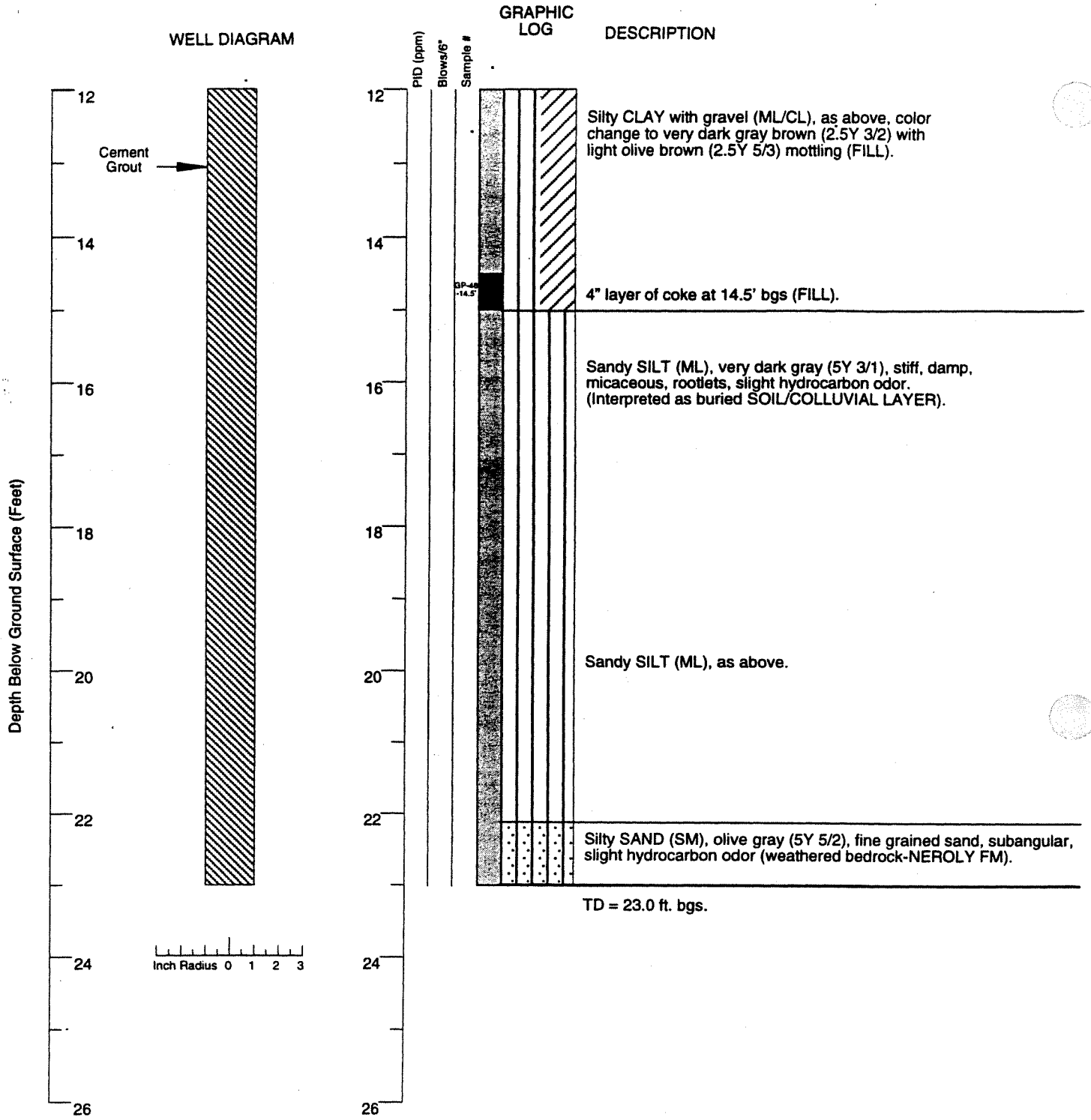
07/97.TR

MONTGOMERY WATSON

Boring Log
GP-48
Tosco Refining Company
San Francisco Area Refinery at Rodeo
Rodeo, CA

SOIL BORING

GP-48



EXPLANATION

- Water level during drilling
- Water level in completed well
- Location of recovered core sample
- Location of sample sealed and chemically tested

Contacts:
- Solid where certain
- Dotted where approximate
- Dashed where uncertain

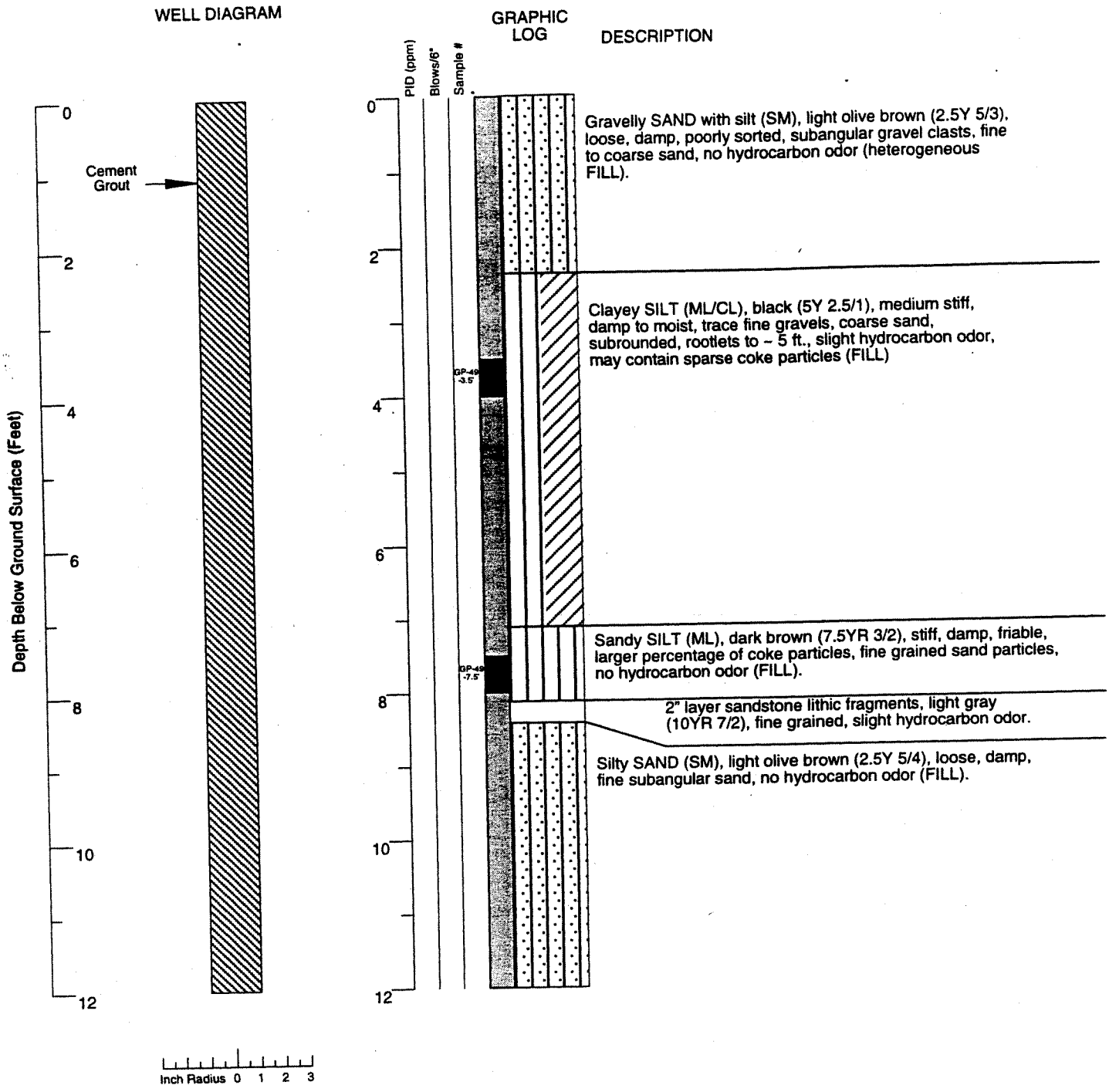
NR No recovery

MONTGOMERY WATSON

Boring Log
GP-48
Tosco Refining Company
San Francisco Area Refinery at Rodeo
Rodeo, CA

SOIL BORING

GP-48



Geologist:	Andrew Kerr	Drilling Company:	Gregg Drilling and Testing, Inc.	Type of Sampler:	1.5" Macro Core
Project Mgr:	Lance Larsen	Drilling Method:	Hydraulic Coring/Direct Push	TD (Total Depth):	20.0 ft. below ground surface
Dates Drilled:	6/26/97	Driller:	Morris Ruud		
Checked by:	J.Ross Wagner, Ph.D., R.G.	Drill Rig:	Geoprobe 5400		

EXPLANATION

- Water level during drilling
- Water level in completed well
- Location of recovered core sample
- Location of sample sealed and chemically tested

Contacts:
- Solid where certain
- Dotted where approximate
- Dashed where uncertain
- NR: No recovery

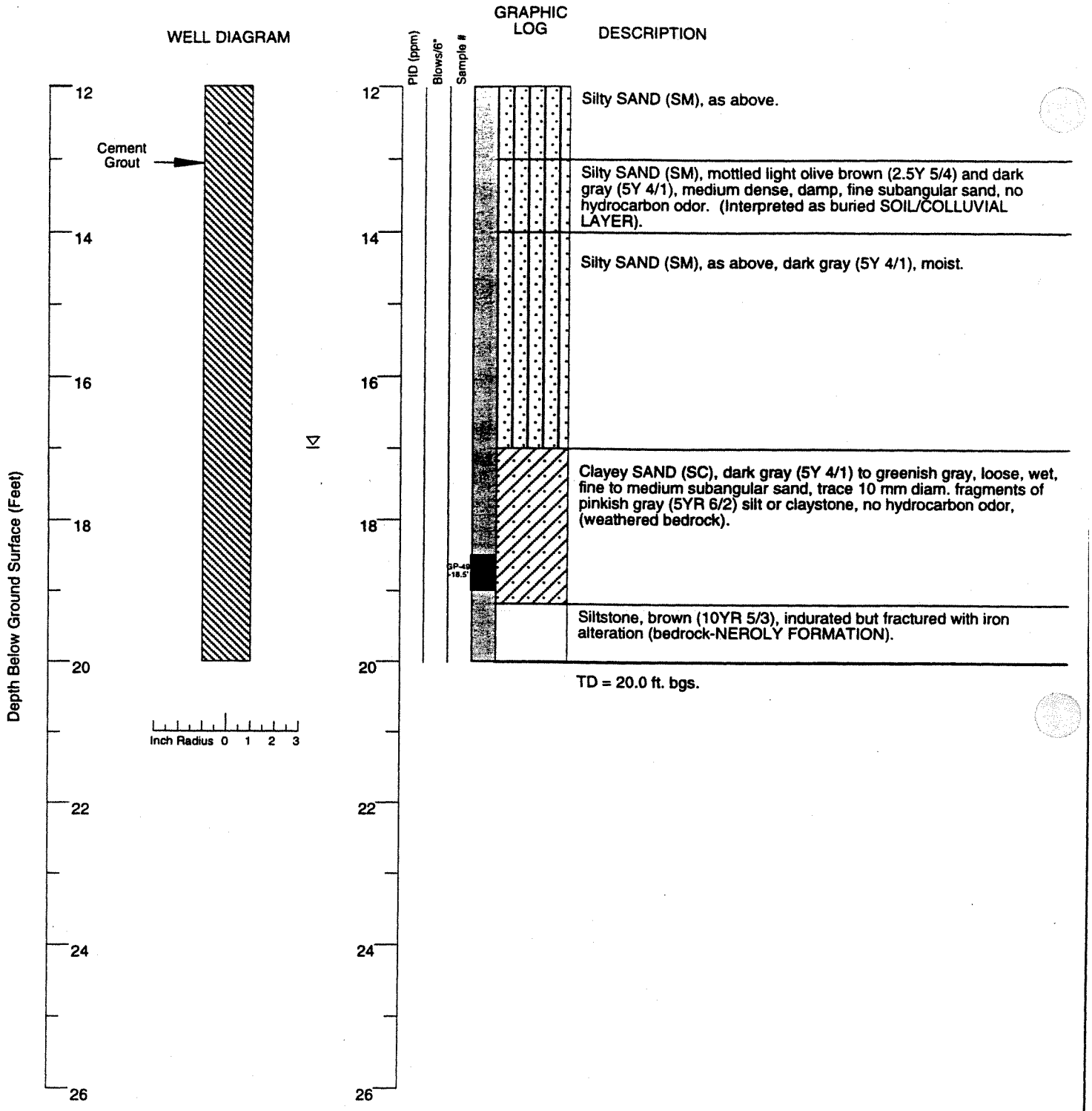
07/97.TR

MONTGOMERY WATSON

Boring Log
GP-49
Tosco Refining Company
San Francisco Area Refinery at Rodeo
Rodeo, CA

SOIL BORING

GP-49



EXPLANATION

- Water level during drilling
- Water level in completed well
- Location of recovered core sample
- Location of sample sealed and chemically tested

Contacts:
- Solid where certain
- Dotted where approximate
- Dashed where uncertain

NR No recovery

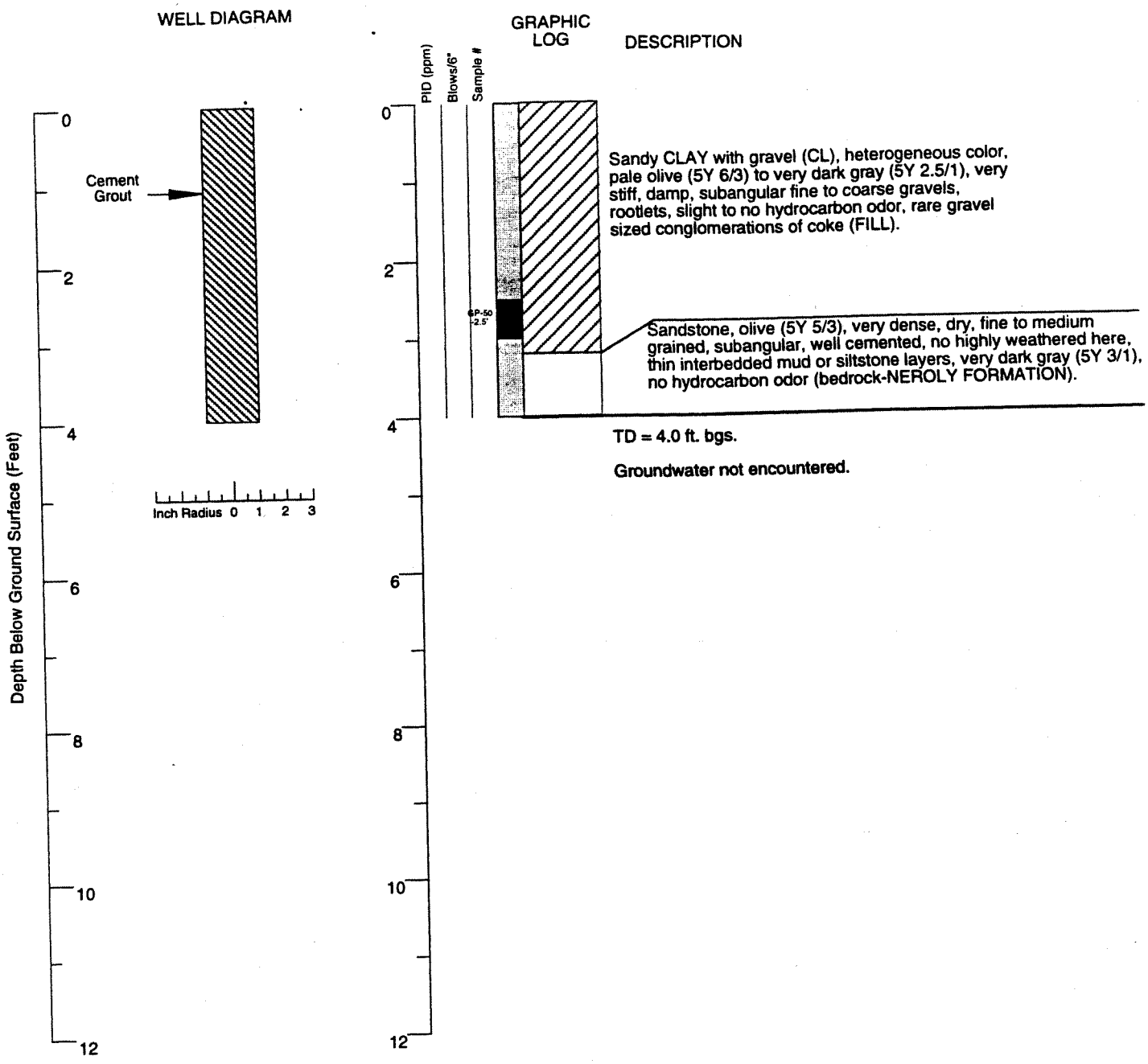
07/97 TR

MONTGOMERY WATSON

Boring Log
GP-49
Tosco Refining Company
San Francisco Area Refinery at Rodeo
Rodeo, CA

SOIL BORING

GP-49



Geologist:	Andrew Kerr	Drilling Company:	Gregg Drilling and Testing, Inc.	Type of Sampler:	1.5" Macro Core
Project Mgr:	Lance Larsen	Drilling Method:	Hydraulic Coring/Direct Push	TD (Total Depth):	4.0 ft. below ground surface
Dates Drilled:	6/26/97	Driller:	Morris Ruud		
Checked by:	J.Ross Wagner, Ph.D., R.G.	Drill Rig:	Geoprobe 5400		

EXPLANATION

- ▽ Water level during drilling
- ▼ Water level in completed well
- ■ Location of recovered core sample
- ■ Location of sample sealed and chemically tested

Contacts:
- ——— Solid where certain
- ..... Dotted where approximate
- – – – – Dashed where uncertain
- NR No recovery

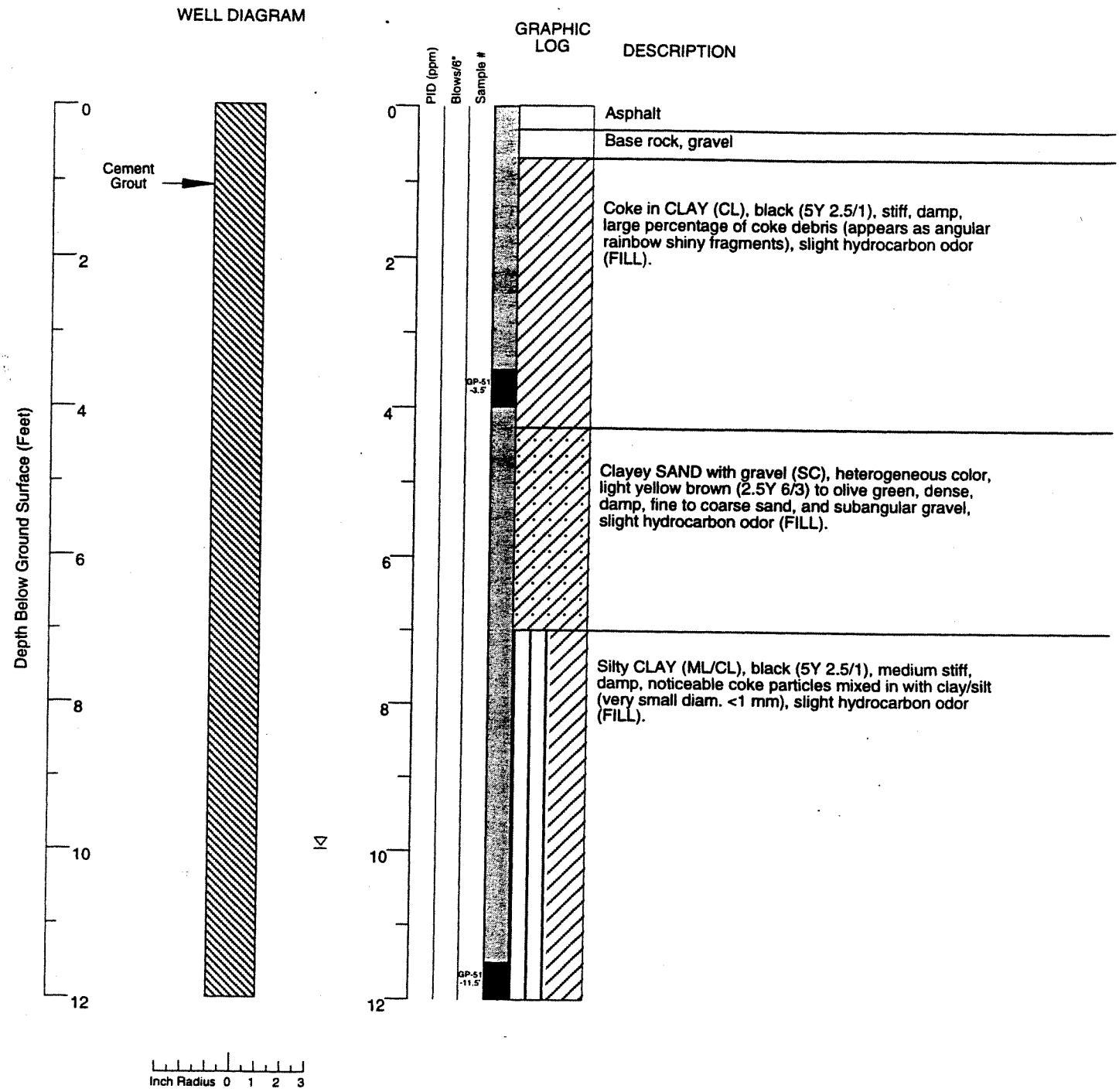
07/97.TR

MONTGOMERY WATSON

Boring Log
GP-50
Tosco Refining Company
San Francisco Area Refinery at Rodeo
Rodeo, CA

SOIL BORING

GP-50



Geologist:	Andrew Kerr	Drilling Company:	Gregg Drilling and Testing, Inc.	Type of Sampler:	1.5" Macro Core
Project Mgr:	Lance Larsen	Drilling Method:	Hydraulic Coring/Direct Push	TD (Total Depth):	14.5 ft. below ground surface
Dates Drilled:	6/25/97	Driller:	Morris Ruud		
Checked by:	J.Ross Wagner, Ph.D., R.G.	Drill Rig:	Geoprobe 5400		

EXPLANATION

- ▽ Water level during drilling
- ▼ Water level in completed well
- Location of recovered core sample
- Location of sample sealed and chemically tested

Contacts:
- ——— Solid where certain
- ····· Dotted where approximate
- – – – Dashed where uncertain

NR No recovery

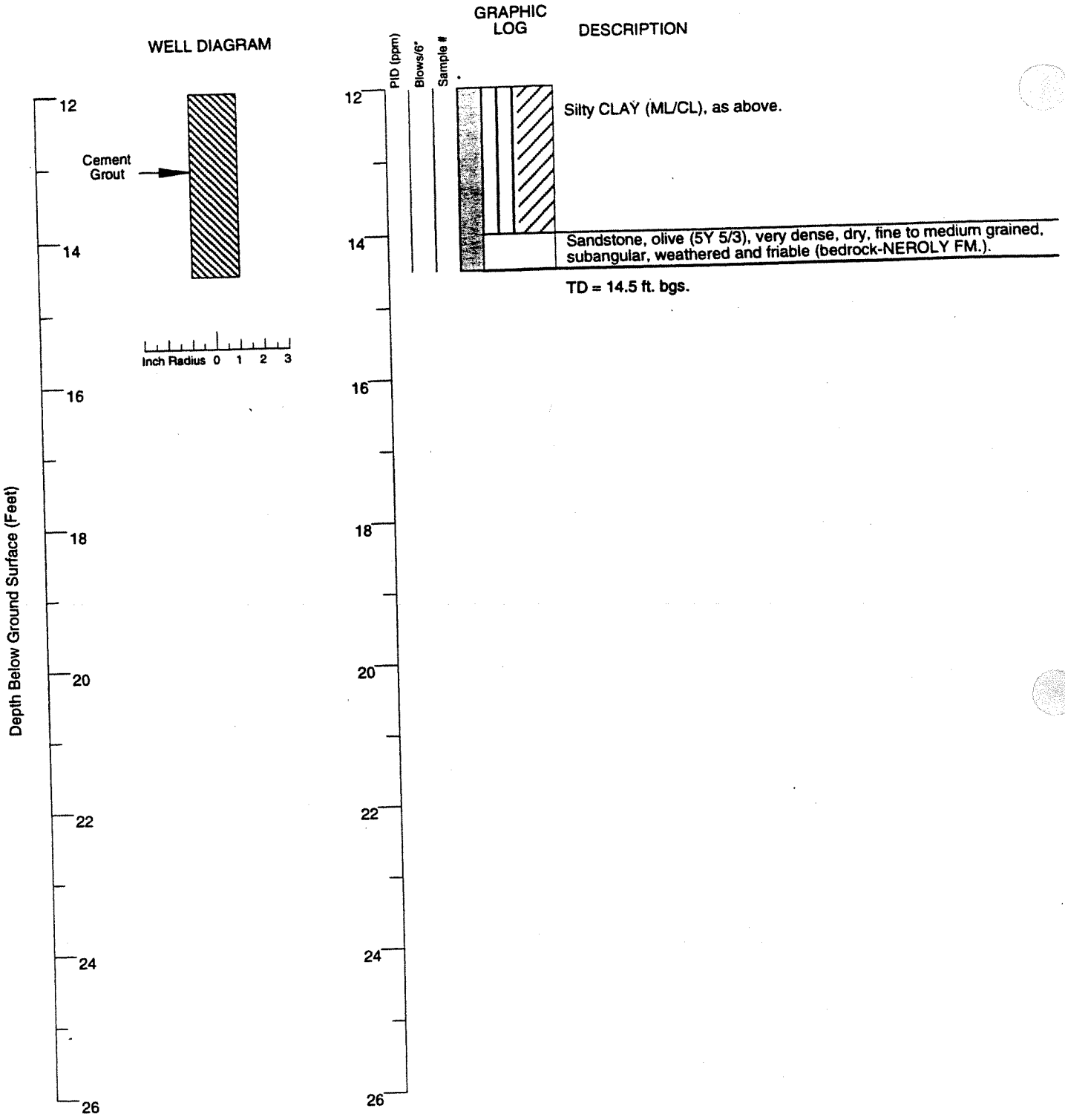
07/97.TR

MONTGOMERY WATSON

Boring Log
GP-51
Tosco Refining Company
San Francisco Area Refinery at Rodeo
Rodeo, CA

SOIL BORING

GP-51



EXPLANATION

- Water level during drilling
- Water level in completed well
- Location of recovered core sample
- Location of sample sealed and chemically tested

Contacts:
- Solid where certain
- Dotted where approximate
- Dashed where uncertain
- NR No recovery

MONTGOMERY WATSON

Boring Log
GP-51
Tosco Refining Company
San Francisco Area Refinery at Rodeo
Rodeo, CA

SOIL BORING

GP-51

APPENDIX B

PHASE I CLOSURE
DECONTAMINATION AND CONFIRMATION/CLOSURE SAMPLING

TABLE OF CONTENTS

TABLES

ATTACHMENTS

APPENDIX B

1.0 PHASE I CLOSURE - DECONTAMINATION AND CONFIRMATION / CLOSURE SAMPLING

Appendix B describes the decontamination and sampling associated with the Bulk Container Storage Unit (BCSU) Phase I closure activities at the ConocoPhillips Refinery (SFR) in Rodeo, California. The scope of work was completed as discussed in the August 2003 Phase I Closure Work Plan (MWH, 2003), the *Response-to-Comments* letter dated February 27, 2004 (MWH, 2004a), and Department of Toxic Substance Control (DTSC) Conditional Approval letter dated April 26, 2004 (DTSC, 2004b). The work included decontamination of equipment, structures and pads followed by collection of asphalt and concrete chip samples, wipe samples, soil samples, groundwater samples, soil gas samples, water samples from the tertiary liner sumps, and water samples from washwater generated during decontamination activities. Figures 5 and 6 in the main report text show the locations of each sample collected at the BCSU during closure sampling. Table B-1 includes the number of samples collected from each media and rationale for deviations from the proposed Closure Work Plan scope of work. Sample collection and procedures are described below.

1.1 DECONTAMINATION

The following items located in the BCSU were decontaminated:

- Two Area B concrete containment pads (including their collection trenches);
- Areas of asphalt cover, including the loading/unloading portion of Area B and the interim storage grounds of Area C;
- Three polyethylene storage tanks on the Lower Terrace concrete containment pad in Area B;
- Aboveground piping for the storage tanks;
- Surface water catch basins; and
- Ancillary BCSU structures including fencing, staircases, scaffolding, and loading/unloading areas.

The asphalt and concrete pads were decontaminated by applying detergent (i.e., ONYX Voom, d-Limonene® solution) to the pavement surface. In areas that were stained, the detergent solution was brushed into the surface. Pavement surfaces that had excessive dust and sediment were first washed with fire hoses attached to nearby SFR fire hydrants prior to placement of the detergent solution. Pressure washing was then completed using hydro-mowers that applied high pressure heated water to the surface and worked in conjunction with the detergent solution to lift oily sediment from the pavement surface. Heated pressure washers or fire hose were then used to rinse the surface of detergent and oily debris generated from the hydro-mower washing. Areas cleaned were inspected and re-rinsed as needed until all surfaces were clean. All sediment in the upper and lower containment pad trenches was shoveled into labeled 55-gallon drums prior to washing. The drums were later disposed of by refinery personnel. All other BCSU equipment, including chain link fencing, tanks, piping, scaffolds, stairs, and trench and catch basin grates were cleaned using the heated pressure washers.

Washwater generated during the cleaning was routed by sandbags or in place drainage piping to the catch basin north of the lower concrete containment pad. The catch basin outlet piping was blocked with sandbags to prevent washwater from entering the refinery stormwater system. The water was pumped from the catch basin using a diaphragm pump into a temporary containment tank staged on the adjacent concrete containment pad. Water in the containment tank was later pumped through the refinery stormwater treatment system. Approximately 25,000 gallons of water was generated during decontamination procedures at the BCSU.

1.2 CONFIRMATION AND CLOSURE SAMPLING

1.2.1 Asphalt Chip Samples

Proposed asphalt samples were collected as outlined in the Closure Work Plan with the exception that the six proposed deeper asphalt samples could not be collected because of the asphalt surface across the BCSU was not sufficiently thick for paired samples (approximately

2 to 3 inches thick). Nineteen asphalt chip samples (plus 3 duplicates) were collected to assess the effectiveness of decontamination of the BCSU asphalt cover and to evaluate the extent to which residual chemicals of potential concern (COPCs) remained in these features. The samples were collected from potentially affected areas, including those with noticeable stains or areas where wastes could have entered the subsurface (i.e. cracks), as well as areas that did not exhibit noticeable cracks or staining. Twelve background samples and one duplicate were also collected from asphalt berms within the BCSU or asphalt roadways outside of the BCSU proper. Background sample locations were selected at areas that appeared clean (i.e., no visual staining) and were away from high traffic areas (i.e., samples collected from the side of roadways and away from low areas were sediment may accumulate). The samples were collected from the top 1-inch of asphalt surface at each location using a chisel. The samples were placed in a labeled 16-ounce wide mouth jar and transported in an insulated cooler following proper chain of custody procedures to Curtis and Tompkins Laboratory.

The samples were analyzed using EPA Methods 9045C for pH, 8260B for volatile organic compounds (VOCs), 6010B and 7471 for the 17 metals regulated under CCR Title 22. The samples were not tested for total petroleum hydrocarbon (TPH) or semi-volatile organic compounds (SVOCs) as per the Closure Work Plan because the chemicals that are included in these general categories are primary components of asphalt, and would not yield useful results. The sampling chisel was decontaminated between each sample location using Alconox soap and rinsed with deionized water.

1.2.2 Concrete Chip Samples

Proposed concrete samples were collected as outlined in the Closure Work Plan with the exception that one of the five deep concrete samples was not collected and one additional duplicate sample was inadvertently collected. Fourteen concrete chip samples (plus three duplicates) were collected to assess the effectiveness of decontamination of the concrete cover and the concrete containment pads and to evaluate the extent to which residual COPCs remained in these features. The samples were collected from potentially affected areas,

including those with noticeable stains or areas where wastes could have entered the subsurface (i.e. cracks), as well as areas that did not exhibit noticeable cracks or staining.

Concrete samples included one from the uppermost surface (0 to 1-inch depth) at the ten locations and four from a paired deeper interval (1 to 4.5 inches) to assess concentration differences with depth. MWH did not sample deeper than 4.5 inches, so as to protect the integrity of the current pads and the underlying geotextile membrane. Three duplicates were also collected for quality control purposes. Samples were collected from three locations from the upper Area B containment pad and trench, five locations from the lower Area B containment pad and trench, and two locations from the Area C concrete pad. In addition, five background chip samples were collected from the raised curb surrounding the upper and lower Area B containment pads. Background samples were collected from areas unlikely to have been affected by past releases of hazardous substances or routinely exposed to contaminants from regular SFR operations.

The samples were collected at each location using a 2-inch to 3-inch diameter concrete coring device. Following removal of the cores from the concrete surface, the concrete cores were broken with a chisel and placed in a labeled 16-oz wide mouth jar. The jars were placed in an insulated cooler and transported following proper chain of custody procedures to Curtis and Tompkins Laboratory. The samples were analyzed using United States Environmental Protection Agency (EPA) Methods 8015B for TPH as diesel and motor oil, 8260B for VOCs, 8270C for SVOCs, and 6010B and 7471 for metals. Additionally, two primary and one duplicate concrete chip sample collected from the area closest to the former polychlorinated biphenyl (PCB) storage shed were analyzed for PCBs using EPA Method 8082.

In addition, one equipment rinse sample was collected by pouring deionized water over the sampling chisel into analysis specific containers. The equipment rinse sample was analyzed for the same parameters as the concrete samples listed above including PCBs. The sampling chisel was decontaminated between each sample location using Alconox soap and rinsed with deionized water.

1.2.3 Wipe Samples

Proposed wipe samples were collected as outlined in the Closure Work Plan with no deviations from the proposed scope-of-work. Nineteen wipe samples were collected including two from each of the three polyethylene storage tanks, two from the piping associated with each tank, two from the two steel stairways, one from each of the three refinery sewer system catch basins, and one from each concrete pad collection trench grating. Samples were collected by wiping a 10 centimeter (cm) by 10 cm area of surface with a 125 millimeter diameter hardened ashless filter paper moistened with acetone, hexane, or deionized water depending on the analysis required and placed in a labeled 8-ounce glass jar. Five quality assurance/quality control wipe samples were collected, including one wipe blank, two wipe duplicates, and two background wipe samples. The background wipe samples were collected from the 24-inch diameter painted steel hydrocarbon conveyance line and 2-inch diameter galvanized line across the street from the BSCU (Figure 5). The purpose of collecting background samples from both a painted and galvanized line was to closely represent samples collected from the painted ancillary piping of the polyethylene storage tanks as well as the steel trench and catch basin grates and metal staircases. The sample containers were labeled and transported in an insulated cooler following proper chain of custody procedures to Curtis and Tompkins Laboratory in Berkeley, California for analysis.

Each wipe sample was analyzed using EPA Methods 8015B for TPH as diesel and motor oil, 8270C for SVOCs, and 6010B and 7470 for metals. The wipe sample from the lower terrace, collection trench grate was also tested for PCBs using EPA Method 8082, given its location relative to the shed in which PCB wastes were stored. Wipe samples were not tested for VOCs and pH given their unlikely presence due to the exposure of the sample surface to the atmosphere and the steam cleaning decontamination process.

1.2.4 Soil Samples

All proposed soil samples were collected as outlined in the Closure Work Plan with the exception that auger refusal prevented the collection of the deeper soil sample at the proposed depth of 8 to 9 feet below ground surface (bgs) in boring BCSU-SB-1. Eight soil borings

were completed at the BCSU to evaluate subsurface soil conditions and to determine if COPCs were present. Eighteen soil samples were collected as compared to the originally proposed 16; complete soil boring logs are included (Attachment B-1). The deviations were predominantly because of the variability of the thickness of fill and the depth to bedrock. The deviations and rationale are explained in Table B-2

The borings were completed to depths of 4 feet to 41 feet bgs using a truck-mounted direct-push drill rig or hollow stem auger drill rig at locations were refusal was encountered using the direct-push rig. The direct-push rig uses a 4-foot-long, by 2-inch inside diameter core barrel lined with a clear polyvinyl chloride (PVC) sample liner. After the core barrel is retrieved from the formation, the barrel is opened and the PVC liner removed. Soil samples were collected continuously in each boring and logged by a MWH field geologist under the direction of a California registered geologist. The soil cores were also screened for hydrocarbon concentration using a photoionization detector (PID).

Soil samples collected and retained for laboratory analysis at one foot bgs and 8 to 9 feet bgs in each boring, and at (2 to 3 feet) in borings BCSU-SB-1, SB-2 and SB-7 where refusal was encountered. Soil samples were retained by cutting a 6-inch section of the sample liner by hand at each sample depth interval. The sample liner was capped on each end with Teflon tape and plastic caps, labeled and placed on ice in an insulated cooler for transportation under proper chain of custody procedures to Curtis and Tompkins Laboratory for analysis. Samples were also collected from an undisturbed portion of the sample core in three 5-gram EnCore™ samplers at each sample depth. Samples were collected in the EnCore™ samplers following procedures outlined in the Closure Work Plan.

At locations where refusal was encountered with the direct-push rig (soil borings BCSU-SB-1, SB-2, SB-6, and SB-7), a truck-mounted hollow-stem-auger drill rig equipped with 8-inch diameter augers was used to extend the borings. Samples were collected at the proposed deeper sampling depths (7.5 to 8 feet bgs) at each of the four locations, with the exception of boring BCSU-SB-1 where auger refusal was again encountered in the boring at 4

feet bgs. Samples were also collected at 5-foot intervals to total depth (41 feet) in boring BCSU-SB-7 for lithologic description. The samples were collected using 1.5-inch diameter by 18-inch split spoon sampler lined with brass sleeve inserts following the procedures outlined above.

The samples were chemically tested using EPA Method 9045C for pH, 8015B for TPH as diesel and motor oil, 8260B for VOCs, 8270C for SVOCs, and 6010B and 7471 for metals.

Twenty background soil samples were collected from bedrock outcrops surrounding the BCSU for quality control purposes. The samples were collected by first removing the top 3 to 6 inches of bedrock surface at each location, and then, using a chisel to collect sufficient sample. The collected bedrock chip samples were placed in 16-ounce wide mouth jars. Only one sample, SoilBckg-5, was collected using the direct-push rig following the procedures outlined above. The samples were labeled and placed on ice in an insulated cooler for transport to Curtis and Tompkins Laboratory for metals analysis by EPA Methods 6010B and 7471. In addition, an equipment rinse sample was collected by pouring deionized water over the chisel into an analysis specific container with analysis specific preservative for the same metals analysis.

Drilling and sampling equipment, including the sampling chisel, was decontaminated between each location and sample interval using Alconox soap and rinsed with deionized water. Soil generated during drilling was collected in 5-gallon pails or 55-gallon drums, labeled, and disposed of by SFR personnel.

Following completion of soil sampling and groundwater sample collection outlined in the following section, each borehole was grouted with Portland cement and topped with cold patch asphalt to match the existing surface grade in accordance with the Contra Costa County Environmental Health Division soil boring permit.

1.2.5 Groundwater Samples

The Closure Work Plan proposed collecting groundwater from each of the eight soil borings to assess groundwater conditions and to evaluate if COPCs were present. Groundwater samples were ultimately collected from two soil borings, BCSU-SB-3 and SB-7. The additional samples were not collected because groundwater was not encountered at the proposed depth of each of the borings (8 to 9 feet bgs). Borings BCSU-SB-3 and SB-7 were extended to depths of 24 and 41 feet bgs, respectively to obtain groundwater samples. Deviations to the groundwater sampling scope-of-work are presented in Table B-2.

Following drilling of soil borings BCSU-SB-3, SB-4, SB-5, and SB-8, temporary ¾-inch diameter screened casing was placed in each boring to allow for the accumulation of groundwater. After approximately 48 hours, borings SB-4, SB-5, and SB-8 were still dry. Soil boring SB-3 had approximately 2 feet of water at the bottom of the boring. Boring SB-7 was deepened to 41 feet bgs for the purpose of obtaining a groundwater sample downgradient of the concrete containment pads.

Groundwater samples were collected from each of the borings using a stainless-steel bailer and decanted into analysis specific containers with analysis specific preservatives. The containers were labeled, placed on ice in an insulated cooler, and transported to Curtis and Tompkins Laboratory. The samples were analyzed using EPA Methods 9040B for pH, 8015B for TPH as diesel and motor oil, 8260B for VOCs, 8270C for SVOCs, and 6020 and 7470 for metals. The metals sample collected from both borings were filtered and preserved in the lab. An equipment rinse sample was collected by pouring deionized water through the stainless steel bailer and into analysis specific containers. The sample was analyzed for the same parameters as the groundwater sample.

1.2.6 Soil Gas Samples

The Closure Work Plan proposed collecting soil gas samples from each of the eight soil borings to assess soil vapor conditions and to evaluate if COPCs were present. Soil gas samples were ultimately collected from four soil borings, BCSU-SB-3, SB-4, SB-5 and SB-8.

Samples were not collected from the other four borings because of the shallow depth of refusal (less than 4 feet bgs) in each of the borings with the direct-push drill rig. Deviations to the soil gas sampling scope of work are presented in Table B-2.

Soil gas samples were collected by installing a second soil boring approximately 5 feet from the original boring at locations were refusal was not encountered at shallow depths using direct-push drilling techniques (BCSU-SB-3A, SB-4A, SB-5A, and SB-8A). The borings were installed by pushing a small diameter metal drive point to a depth of 7 feet to 9 feet bgs at each of the four locations using a direct-push drill rig. When the drive point, which was connected at the surface with small diameter plastic tubing, was emplaced at the desired depth, the point was retracted exposing the subsurface vapor to the plastic tubing connected to the drive point. At least 20 minutes of equilibration time was allowed prior to sample collection. The tubing at the surface was connected to a ball valve, an Air Toxics Ltd. flow controller, and two 6 liter Summa canisters (one for purging and the other for sampling) using Swage lock fittings. Bentonite was placed around the drill rod at the surface to create a surface seal. Prior to sampling, a leak test was performed on the surface connections by closing the ball valve and opening the valve on the purge canister for ten minutes. The pressure gauge on the purge canister was used to determine if there was any drop in pressure indicating a leak in the fitting connections. Following a successful leak test, which constituted no or very little drop in pressure, the purge tank was opened and at least three purge volumes were removed from the sampling line. Following purging, the sample tank was opened to begin collection of the soil gas sample. The sample was collected at a flow rate no greater than 200 ml/min. Prior to sample collection, isopropyl alcohol was placed on the all the surface fitting connection as a tracer compound if detected during analysis. During sample collection, a cotton ball with isopropyl alcohol was placed at the top of the drive rod where the plastic tubing extended from the subsurface. A drop of isopropyl alcohol was placed on the cotton ball every approximately five minutes.

The Summa canister was closed and labeled following sample collection. In addition to the samples collected from the four soil gas borings, one duplicate sample, and one field blank

were collected. The field blank was collected by drawing ambient surface air through an approximately 9-foot section of plastic tubing. The samples were submitted to Air Toxics, Ltd., laboratory in Folsom, California for VOC analysis by EPA Method TO-14A.

1.2.7 Water Samples from Tertiary Liner Containment Sumps

Water samples were collected from the Upper and Lower Terrace containment pad collection sumps (Sump-1 and Sump-2, respectively). The purpose of the sampling was to evaluate if water that accumulated in the lined containment area beneath the concrete pad contained contaminants from waste storage activities at the site. The samples were collected from each sump following an initial pump out and recharge of water into the sumps. The samples were collected using a disposable bailer and decanted into analysis specific containers with analysis specific preservative. The sample for metals analysis was collected using a pressurized bailer and filter. The samples were labeled, placed on ice in an insulated cooler, and transported to Curtis and Tompkins Laboratory for analysis following proper chain of custody procedures. The samples were analyzed by EPA methods 8015M for TPH-diesel and motor oil, 8260B for VOCs, 8270C for SVOCs, 6020 and 7471 for California Title 22 metals and mercury, and 9045C for pH.

1.2.8 Washwater Sample

Washwater generated during site-wide decontamination activities was temporarily stored on site in a 21,000-gallon containment tank. A sample of the washwater was collected from the tank for characterization purposes using a disposable bailer and decanted in analysis specific containers with analysis specific preservatives. The samples were labeled, placed on ice in an insulated cooler, and transported to Curtis and Tompkins Laboratory following proper chain of custody procedures. The samples were chemically tested following EPA Methods 8015B for TPH as diesel and motor oil, 8260B for VOCs, 8270C for SVOCs, and 6020 and 7470 for metals.

TABLES

ATTACHMENT B-1

SOIL BORING LOGS

TABLES

TABLE B-1
IMPLEMENTED SAMPLING SCOPE
BULK CONTAINER STORAGE UNIT CLOSURE
SAN FRANCISCO REFINERY, RODEO, CALIFORNIA

	Scope of Closure Plan	Number of Samples Collected	Difference	Rationale
Asphalt Chip				
Closure	25	19	(6)	Asphalt was found to only be 2 to 3 inches thick.
Background	12	12	-	The six proposed deeper asphalt samples not collected.
Duplicates	4	4	-	
Concrete Chip				
Shallow	10	10	-	
Deep	5	4	-	One deep concrete sample was inadvertently not sampled.
Background	5	5	-	
Duplicates	2	3	1	
Equipment Rinse	1	1	-	
Wipes				
Primary	19	19	-	
Background	2	2	-	
Duplicates	2	2	-	
Blank	1	1	-	
Soil				
Closure	16	18	2	
Background	20	20	-	
Horiz. Coring	4	0	(4)	Not proposed to be conducted based on data from the tertiary liner sump samples and inspection of the concrete containment pads as per August 4, 2004 Waiver Letter (MWH, 2004)
Equipment Rinse	2	1	(1)	Second equipment rinse was proposed to be collected during drilling of the horizontal borings.
Groundwater				
Closure	8	2	(6)	Shallow bedrock and limited encountered groundwater. Ultimately sampled groundwater at only SB-3 and SB-7. Expanded depth of SB-7 to 41 feet bgs (~ 33.5 feet into bedrock) to intercept groundwater.
Duplicate	1	0	(1)	Low volume of groundwater in the two borings sampled prevented the collection of a duplicate sample.
Equipment Rinse	1	1	-	
Soil Gas				
Closure	8	4	(4)	Soil vapor samples collected at the 4 borings where
Duplicate	1	1	-	there was fill deeper than the 4 foot bgs limit (SB-3, SB-4
Method Blank	1	1	-	SB-5, and SB-8). Bedrock encountered at 4 feet bgs or less in the other 4 soil borings.

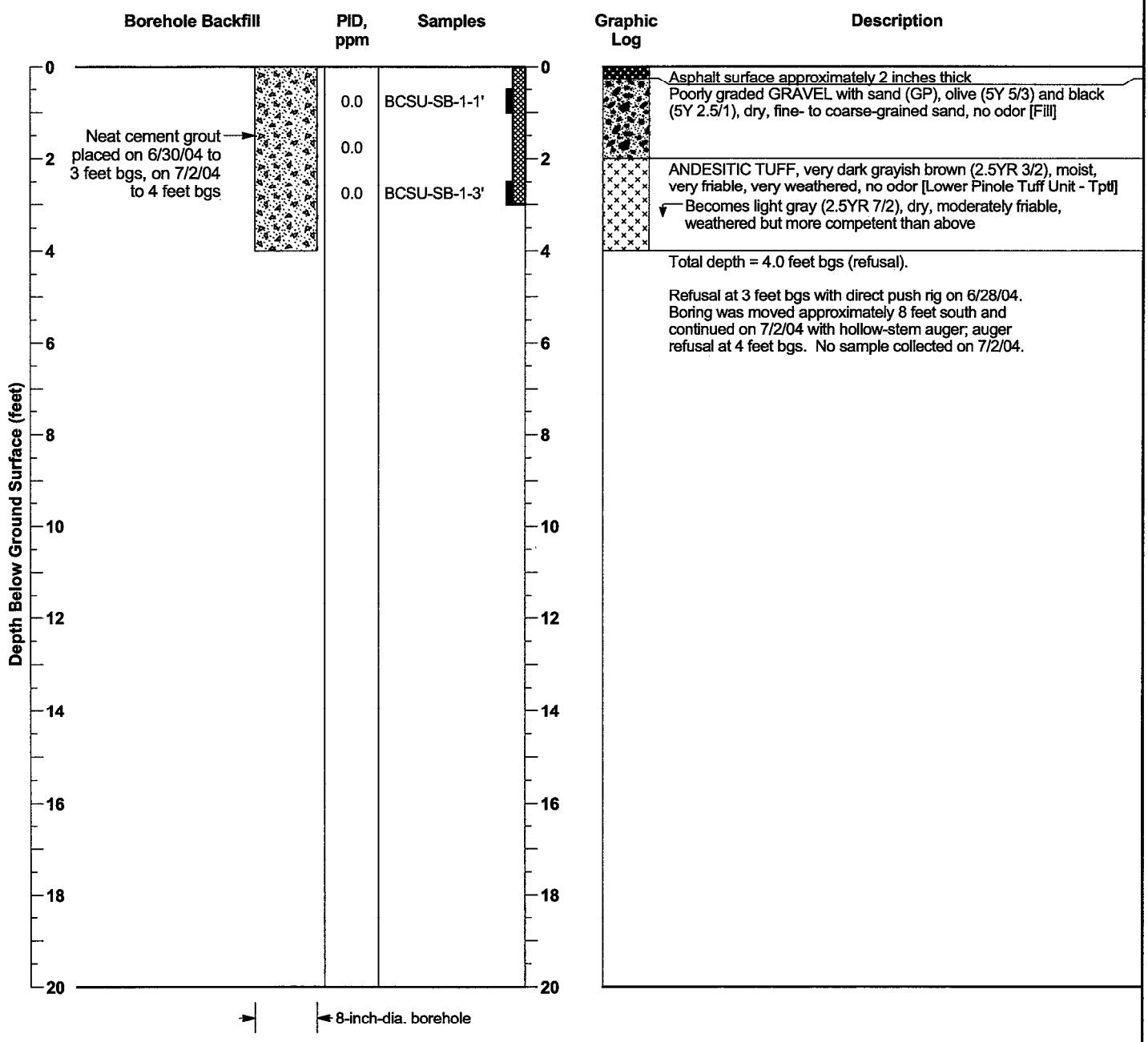
MWH, 2004. Waiver Request for Soil Sampling Beneath Concrete Containment Pads
Phase I Closure Process, Bulk Container Storage Unit, San Francisco Refinery
Rodeo, California. EPA ID Number CAD 009108705

Table B-2
Subsurface Sampling Activities
Bulk Container Storage Unit Closure
ConocoPhillips San Francisco Refinery, Rodeo, California

Soil Boring	Date Drilled	Total Depth (ft bgs)	Occurance of Fill Material (ft bgs)	Occurance of Colluvium (ft bgs)	Depth to Bedrock (ft bgs)	Depth to Groundwater (ft bgs)	Soil Sample Intervals (ft bgs)	Soil Gas Sample Collection Depth (ft bgs)	Comments	Deviations from Work Plan
SB-1	28-Jun& 2-Jul-04	4.0	0.0-2.0	--	2.0	--	0.5-1.0 2.5-3.0	--	Shallow bedrock. Refusal at 3 and 4 feet bgs using both direct push and hollow-stem auger drilling methods, respectively.	Because of the shallow depth of refusal, a soil sample from the proposed depth of 8-9 feet bgs and the soil gas sample not collected. Also no groundwater sample collected.
SB-2	28-Jun& 2-Jul-04	9.5	0.0-1.0	1.0-2.0	2.0	--	0.5-1.0 2.5-3.0 8.0-9.5	--	Shallow bedrock. Refusal at 3 feet bgs using direct push drilling methods. Boring extended to 9.5 feet bgs using a hollow-stem auger drill rig.	Need to extend soil boring using a hollow-stem auger drill rig precluded collecting a soil gas sample. Groundwater sample not collected, as it was not present in the boring.
SB-3	28-Jun-04	24	0.0-20	20.0-24.0	--	Approx. 22	0.5-1.0 7.5-8.0	8.0	Very slow groundwater recharge	None
SB-4	28-Jun-04	10	0.0-9.0	9.0-10.0	--	--	0.5-1.0 8.5-9.0	9.0	Borehole left open for 2 days. Did not accumulate groundwater.	Groundwater sample not collected, as it was not present in the boring.
SB-5	28-Jun-04	15.5	0.0-7.0	7.0-15.0	15.0	--	0.5-1.0 7.5-8.0	8.0	Borehole left open for 2 days. Did not accumulate groundwater.	Groundwater sample not collected, as it was not present in the boring.
SB-6	28-Jun& 2-Jul-04	8.5	0.0-1.5	--	1.5	--	0.5-1.0 8-8.5	--	Shallow bedrock. Refusal at 2 feet bgs using direct push drilling methods. Boring extended to 8.5 feet bgs using a hollow-stem auger drill rig.	Need to extend soil boring using a hollow-stem auger drill rig precluded collecting a soil gas sample. Groundwater sample not collected, as it was not present in the boring.
SB-7	28-Jun& 2-Jul-04	41	0.0-1.5	--	1.5	Approx. 40	0.5-1.0 1.5-2.0 8.0-9.0	--	Shallow bedrock. Refusal at 2 feet bgs using direct push drilling methods. Boring extended to 41 bgs feet using a hollow-stem auger drill rig.	Need to extend soil boring using a hollow-stem auger drill rig precluded collecting a soil gas sample.
SB-8	28-Jun-04	7.5	0.0-1.5	1.5-7.5	7.5	--	0.5-1.0 7.0-7.5	7.5	Borehole left open for 2 days. Did not accumulate groundwater.	No groundwater sample collected

ATTACHMENT B-1

SOIL BORING LOGS



Geologist:	**David Bean**	Drilling Contractor:	**Gregg Drilling & Testing, Inc.**	Driller:	**Paul Rogers / Gene Nunes**
Project Mgr.:	**Andrew Kerr, R.G.**	Drilling Method:	**Direct Push / Hollow-Stem Auger**	Sampler Type:	**4-foot-long Macrocore**
Reviewed By:	**Andrew Kerr, R.G.**	Drill Rig:	**Marl 5-T (2-in.) / Mobile B-61 (8-in. HSA)**	Total Depth:	**4.0 feet bgs**
Date(s) Drilled:	**6/28/04 and 7/2/04**	Depth to Water:	**Not encountered ATD**	Ground Elevation:	**Not available**

EXPLANATION

Sample Symbols

- Sampled Interval
- Location of Sample Sealed for Analysis
- Location of Sample Held in Laboratory
- No Sample Recovery

- ▽ Water Level During Drilling
- ▼ Water Level After Drilling

[Bay Mud] - Interpreted lithologic unit
FPLH - Free phase liquid hydrocarbons

Contacts

- ——— Solid where certain
- – – – Dashed where approximate

LOG OF BORING BCSU-SB-1

Bulk Container Storage Unit Closure Project
ConocoPhillips San Francisco Refinery, Rodeo, CA
Project Number 1881212.0518

MWH

BCSU-SB-1
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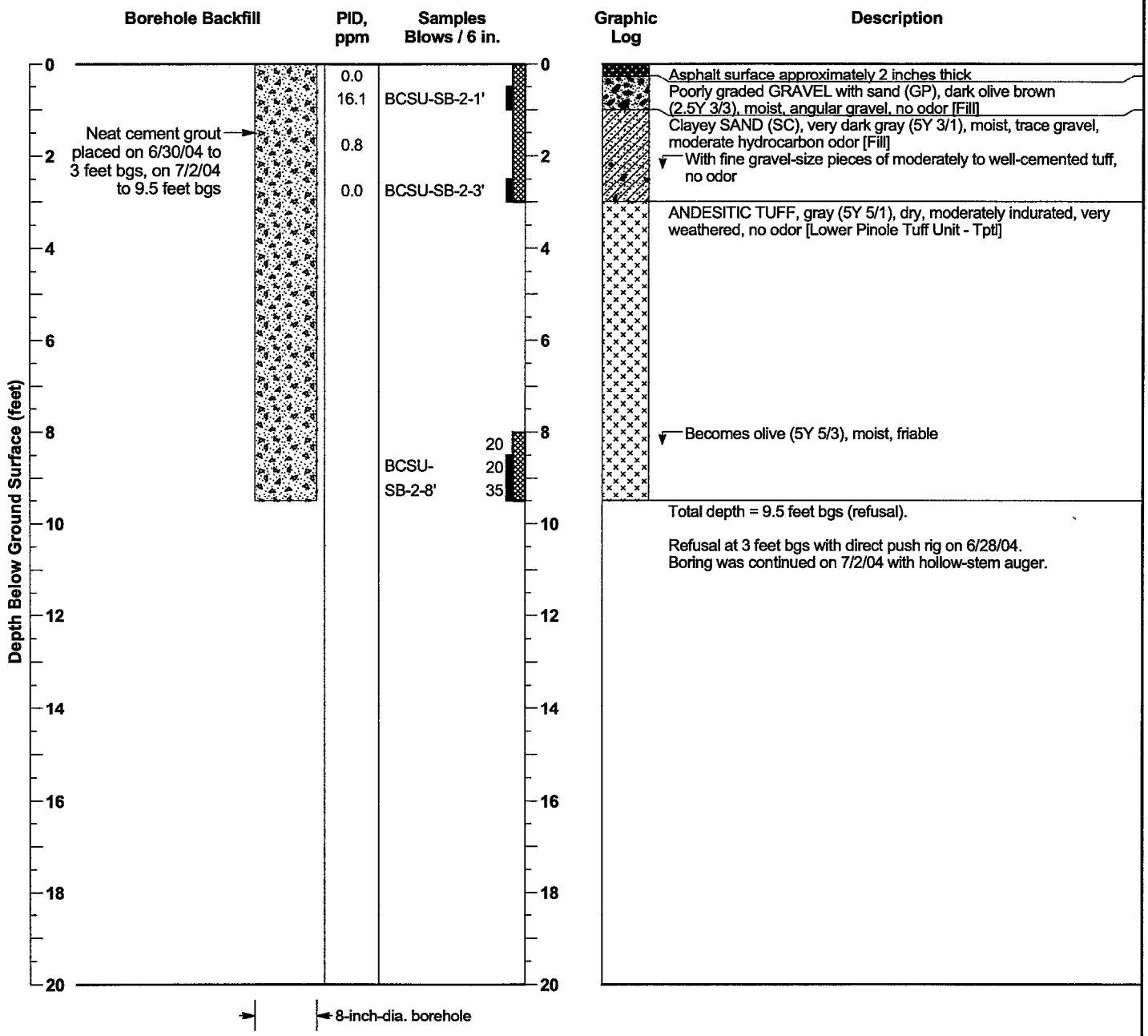
MW_BORING_2AM CPRBULKS.GPJ M_WATSON.GDT 7/30/04



Geologist:	**David Bean**	Drilling Contractor:	**Gregg Drilling & Testing, Inc.**	Driller:	**Paul Rogers / Gene Nunes**
Project Mgr.:	**Andrew Kerr, R.G.**	Drilling Method:	**Direct Push / Hollow-Stem Auger**	Sampler Type:	**Macrocore / SPT split spoon**
Reviewed By:	**Andrew Kerr, R.G.**	Drill Rig:	**Marl 5-T (2-in.) / Mobile B-61 (8-in. HSA)**	Total Depth:	**9.5 feet bgs**
Date(s) Drilled:	**6/28/04 and 7/2/04**	Depth to Water:	**Not encountered ATD**	Ground Elevation:	**Not available**

EXPLANATION

Sample Symbols

- Sampled Interval
- Location of Sample Sealed for Analysis
- Location of Sample Held in Laboratory
- No Sample Recovery

- ▽ Water Level During Drilling
- ▼ Water Level After Drilling

[Bay Mud] - Interpreted lithologic unit
FPLH - Free phase liquid hydrocarbons

Contacts

- ——— Solid where certain
- – – – Dashed where approximate

LOG OF BORING BCSU-SB-2

Bulk Container Storage Unit Closure Project
ConocoPhillips San Francisco Refinery, Rodeo, CA
Project Number 1881212.0518

MWH

BCSU-SB-2
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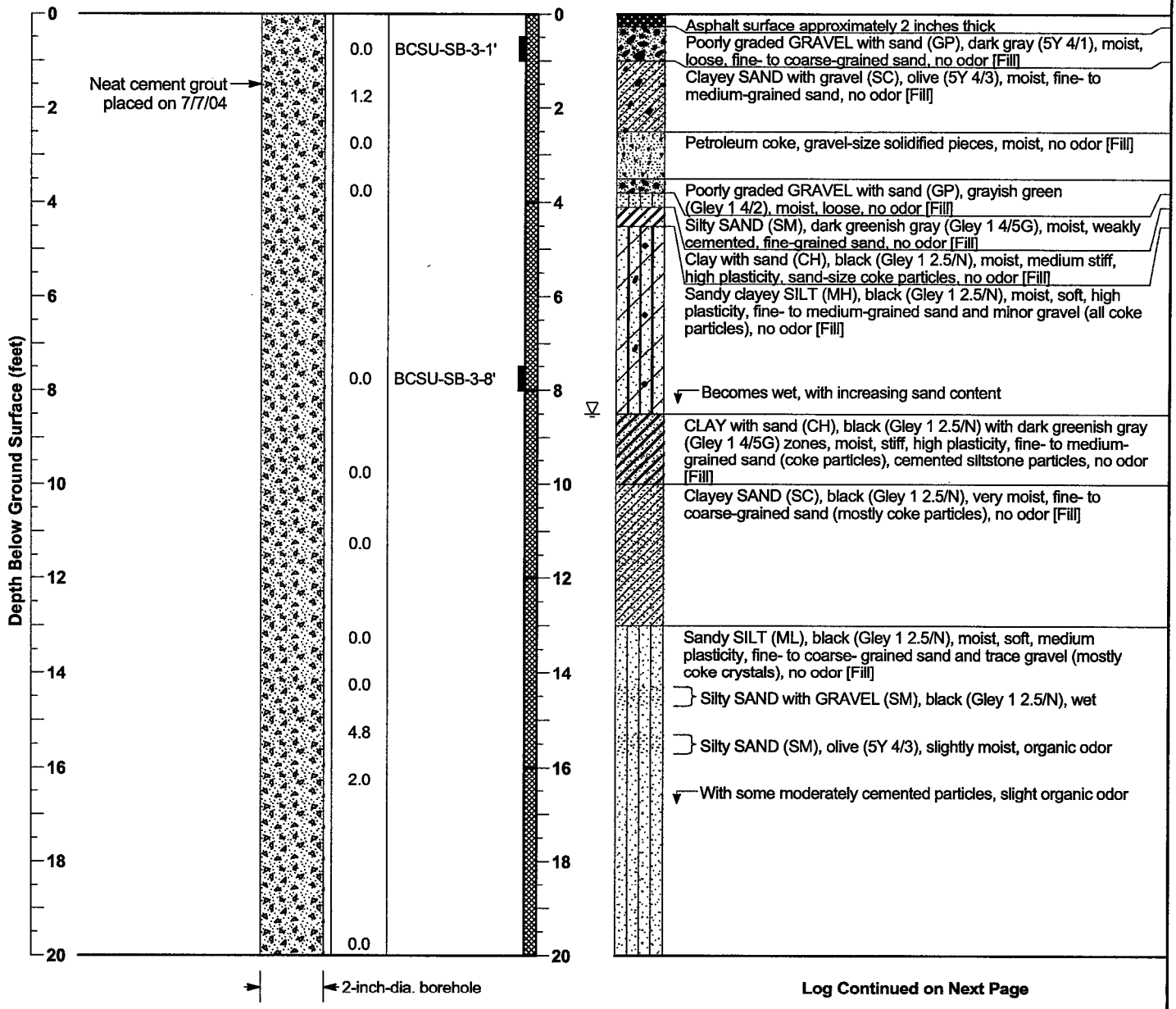
MW_BORING_2AM CPRBULKS.GPJ M_WATSON.GDT 7/30/04



Log Continued on Next Page

Geologist:	**David Bean**	Drilling Contractor:	**Gregg Drilling & Testing, Inc.**	Driller:	**Paul Rogers**
Project Mgr.:	**Andrew Kerr, R.G.**	Drilling Method:	**Direct Push**	Sampler Type:	**4-foot-long Macrocore**
Reviewed By:	**Andrew Kerr, R.G.**	Drill Rig:	**Marl 5-T (2-inch open drive point)**	Total Depth:	**24.0 feet bgs**
Date(s) Drilled:	**6/28/04**	Depth to Water:	**8.5 feet bgs ATD; 22 feet bgs on 6/30/04**	Ground Elevation:	**Not available**

EXPLANATION

Sample Symbols

- Sampled Interval
- Location of Sample Sealed for Analysis
- Location of Sample Held in Laboratory
- No Sample Recovery

- ▽ Water Level During Drilling
- ▼ Water Level After Drilling

[Bay Mud] - Interpreted lithologic unit
FPLH - Free phase liquid hydrocarbons

Contacts

- ——— Solid where certain
- – – – Dashed where approximate

LOG OF BORING BCSU-SB-3

Bulk Container Storage Unit Closure Project
ConocoPhillips San Francisco Refinery, Rodeo, CA
Project Number 1881212.0518

MWH

BCSU-SB-3
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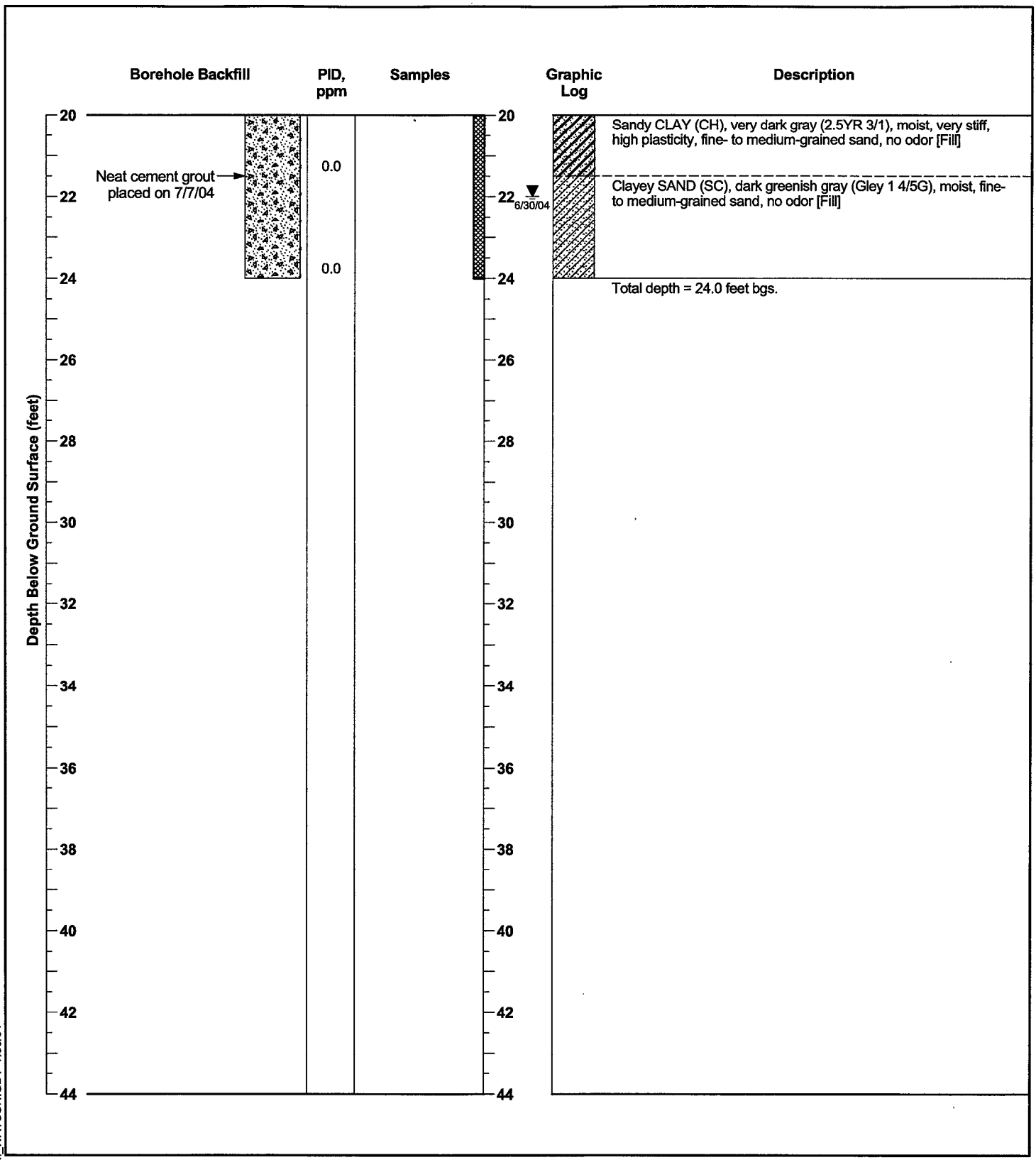
MW_BORING_2AM CPRBULKS.GPJ M_WATSON.GDT 7/30/04



EXPLANATION

Sample Symbols

- Sampled Interval
- Location of Sample Sealed for Analysis
- Location of Sample Held in Laboratory
- No Sample Recovery

- ▽ Water Level During Drilling
- ▼ Water Level After Drilling

[Bay Mud] - Interpreted lithologic unit
FPLH - Free phase liquid hydrocarbons

Contacts

- ——— Solid where certain
- – – – Dashed where approximate

LOG OF BORING BCSU-SB-3

Bulk Container Storage Unit Closure Project
ConocoPhillips San Francisco Refinery, Rodeo, CA
Project Number 1881212.0518

MWH

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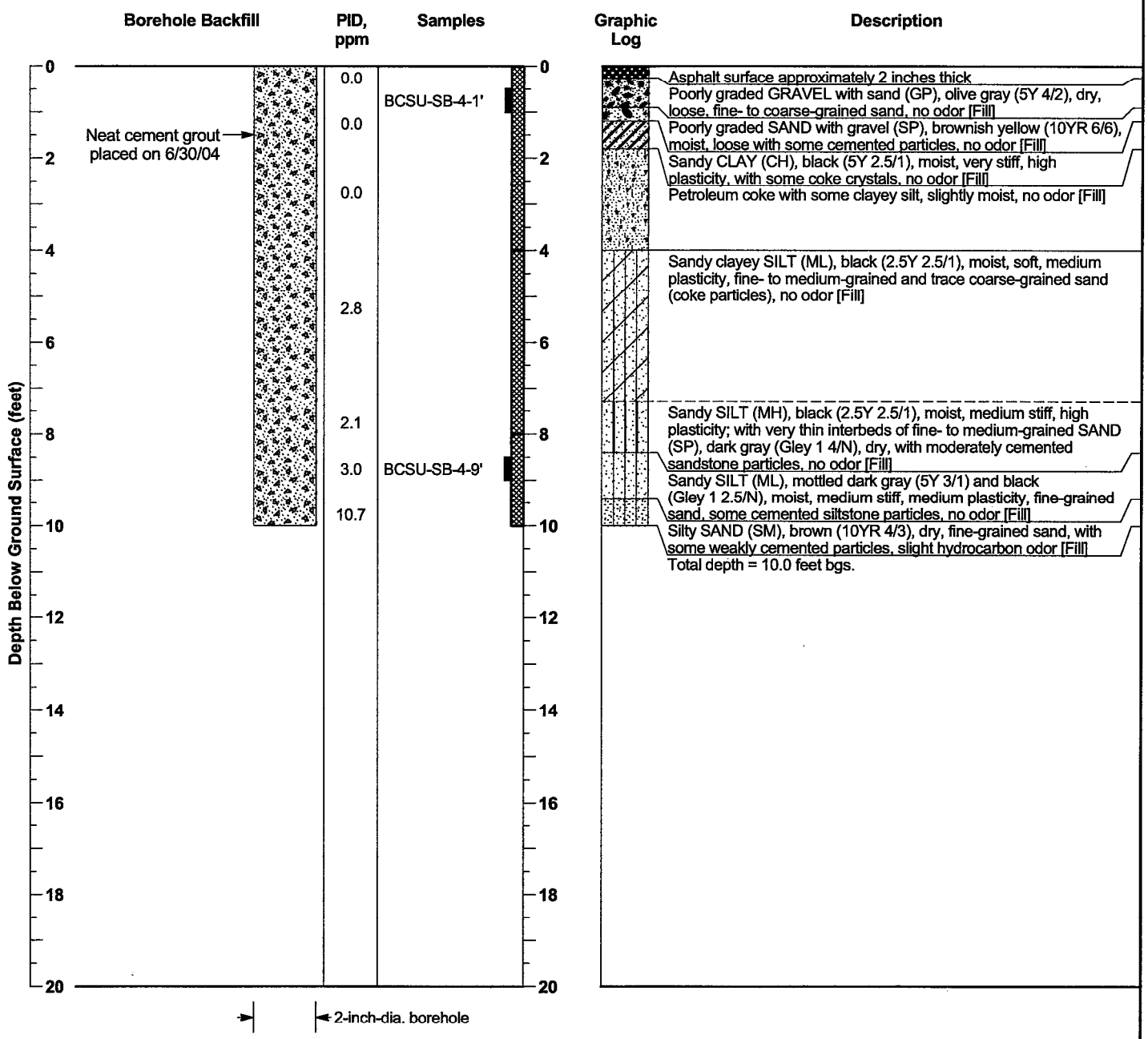
MW_BORING_2AM_CPRBULKS.GPJ M_WATSON.GDT 7/30/04



Geologist:	**David Bean**	Drilling Contractor:	**Gregg Drilling & Testing, Inc.**	Driller:	**Paul Rogers**
Project Mgr.:	**Andrew Kerr, R.G.**	Drilling Method:	**Direct Push**	Sampler Type:	**4-foot-long Macrocore**
Reviewed By:	**Andrew Kerr, R.G.**	Drill Rig:	**Marl 5-T (2-inch open drive point)**	Total Depth:	**10.0 feet bgs**
Date(s) Drilled:	**6/28/04**	Depth to Water:	**Not encountered ATD**	Ground Elevation:	**Not available**

EXPLANATION

Sample Symbols

- Sampled Interval
- Location of Sample Sealed for Analysis
- Location of Sample Held in Laboratory
- No Sample Recovery

- ▽ Water Level During Drilling
- ▼ Water Level After Drilling

[Bay Mud] - Interpreted lithologic unit
FPLH - Free phase liquid hydrocarbons

Contacts

- ——— Solid where certain
- – – – Dashed where approximate

LOG OF BORING BCSU-SB-4

Bulk Container Storage Unit Closure Project

ConocoPhillips San Francisco Refinery, Rodeo, CA

Project Number 1881212.0518

MWH

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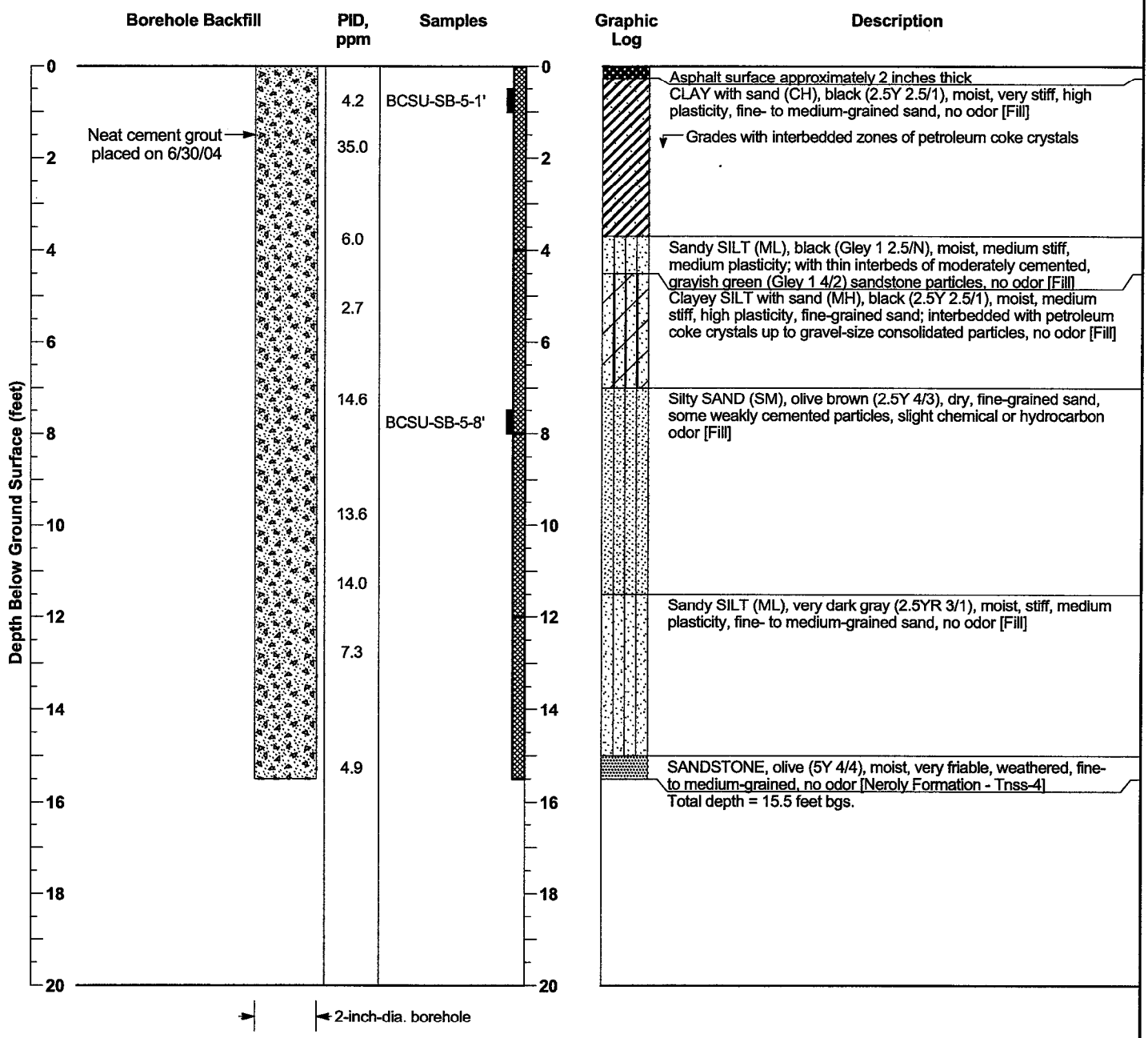
MW_BORING_2AM_CPRBULKS.GPJ M_WATSON.GDT 7/30/04



Geologist:	**David Bean**	Drilling Contractor:	**Gregg Drilling & Testing, Inc.**	Driller:	**Paul Rogers**
Project Mgr.:	**Andrew Kerr, R.G.**	Drilling Method:	**Direct Push**	Sampler Type:	**4-foot-long Macrocore**
Reviewed By:	**Andrew Kerr, R.G.**	Drill Rig:	**Marl 5-T (2-inch open drive point)**	Total Depth:	**15.5 feet bgs**
Date(s) Drilled:	**6/28/04**	Depth to Water:	**Not encountered ATD**	Ground Elevation:	**Not available**

EXPLANATION

Sample Symbols

- Sampled Interval
- Location of Sample Sealed for Analysis
- Location of Sample Held in Laboratory
- No Sample Recovery

- ▽ Water Level During Drilling
- ▼ Water Level After Drilling

[Bay Mud] - Interpreted lithologic unit
FPLH - Free phase liquid hydrocarbons

Contacts

- ——— Solid where certain
- – – – Dashed where approximate

LOG OF BORING BCSU-SB-5

Bulk Container Storage Unit Closure Project

ConocoPhillips San Francisco Refinery, Rodeo, CA

Project Number 1881212.0518

MWH

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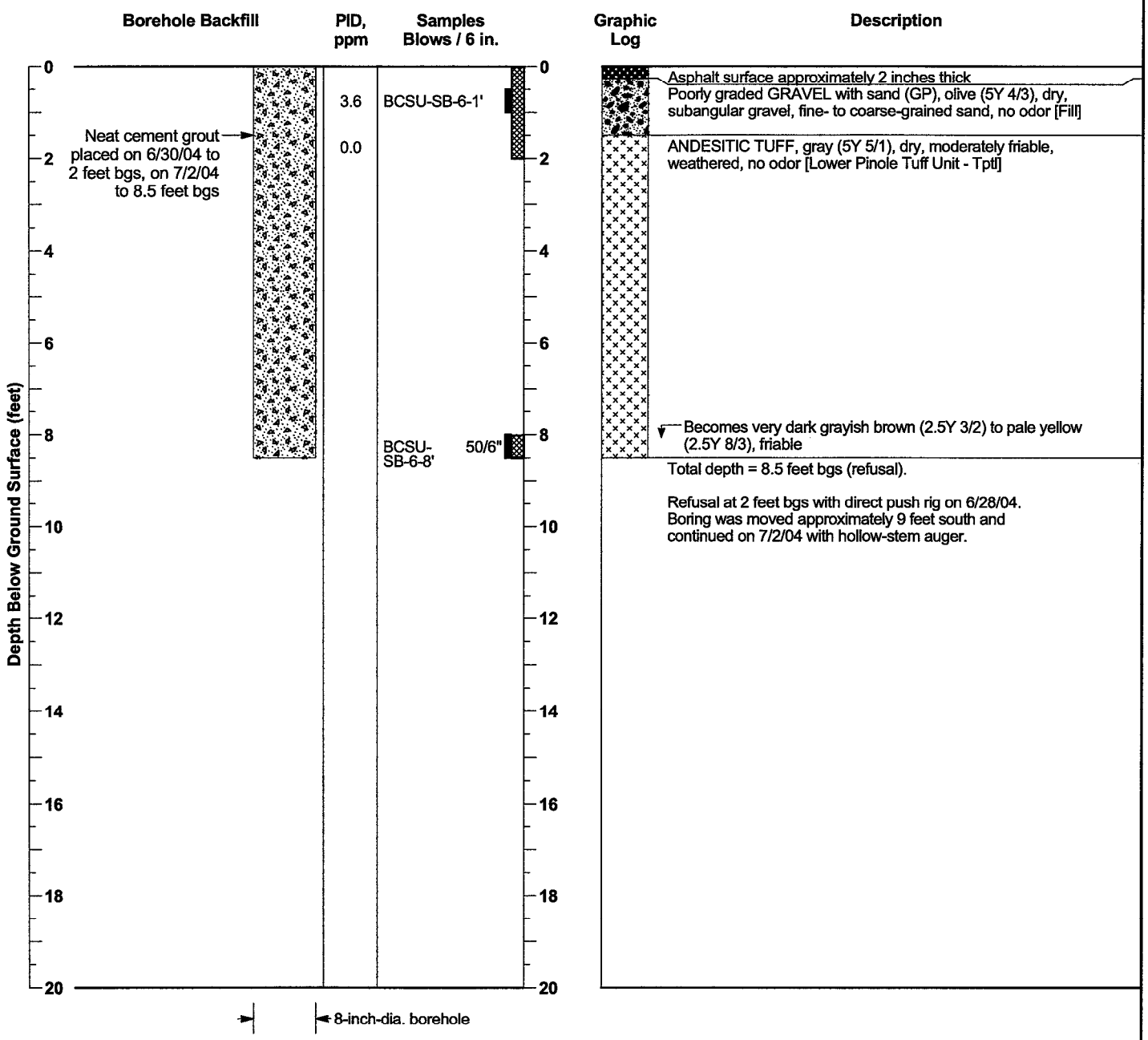
MW_BORING_2AM CPRBULKS.GPJ M_WATSON.GDT 7/30/04



Geologist:	**David Bean**	Drilling Contractor:	**Gregg Drilling & Testing, Inc.**	Driller:	**Paul Rogers / Gene Nunes**
Project Mgr.:	**Andrew Kerr, R.G.**	Drilling Method:	**Direct Push / Hollow-Stem Auger**	Sampler Type:	**Macrocore / SPT split spoon**
Reviewed By:	**Andrew Kerr, R.G.**	Drill Rig:	**Marl 5-T (2-in.) / Mobile B-61 (8-in. HSA)**	Total Depth:	**8.5 feet bgs**
Date(s) Drilled:	**6/28/04 and 7/2/04**	Depth to Water:	**Not encountered ATD**	Ground Elevation:	**Not available**

EXPLANATION

Sample Symbols

- Sampled Interval
- Location of Sample Sealed for Analysis
- Location of Sample Held in Laboratory
- No Sample Recovery

- Water Level During Drilling
- Water Level After Drilling

[Bay Mud] - Interpreted lithologic unit
FPLH - Free phase liquid hydrocarbons

Contacts

- ——— Solid where certain
- – – – Dashed where approximate

LOG OF BORING BCSU-SB-6

Bulk Container Storage Unit Closure Project
ConocoPhillips San Francisco Refinery, Rodeo, CA
Project Number 1881212.0518

MWH

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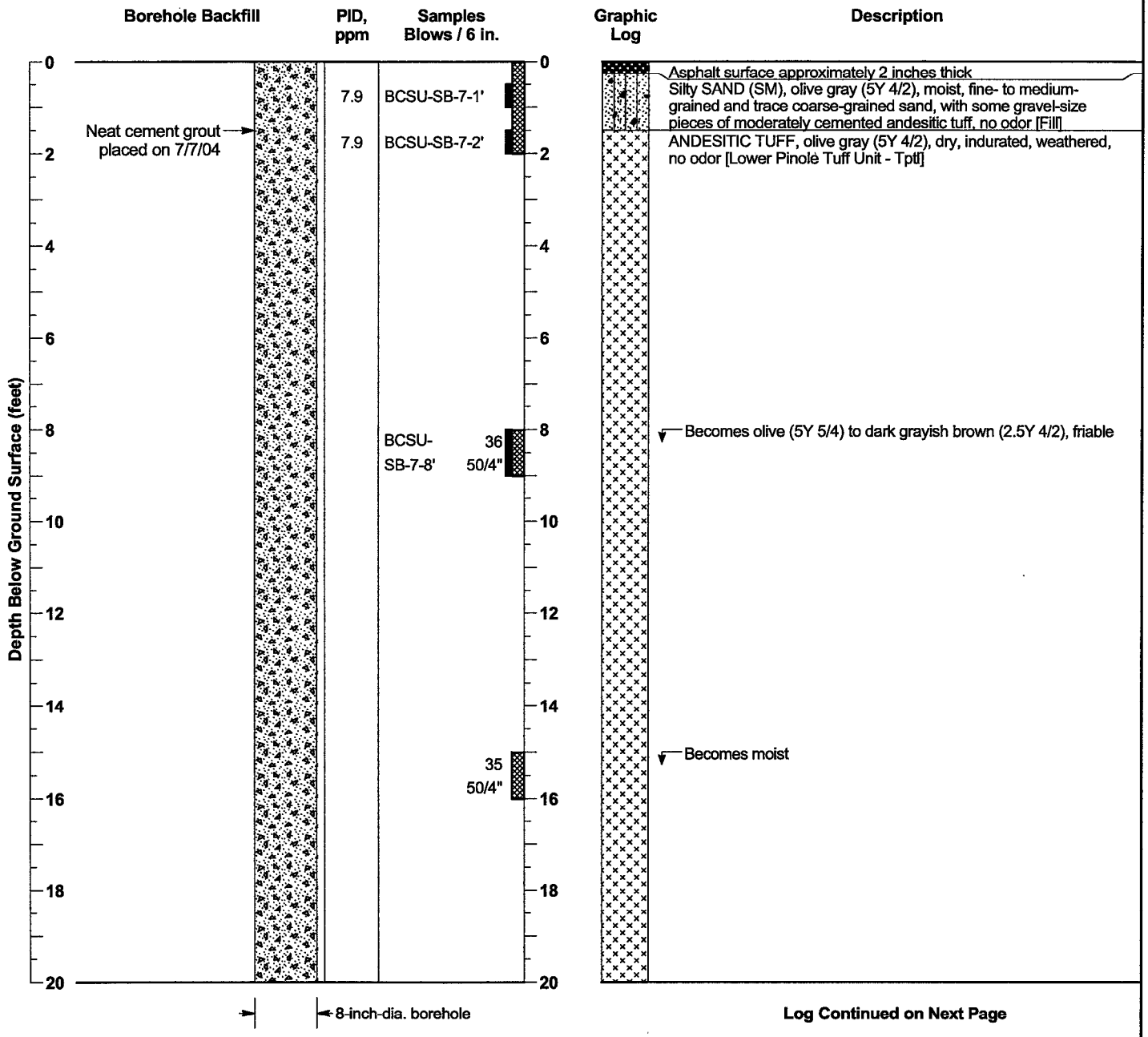
MW_BORING_2AM_CPRBULKS.GPJ M_WATSON.GDT 7/30/04



Geologist:	**David Bean**	Drilling Contractor:	**Gregg Drilling & Testing, Inc.**	Driller:	**Paul Rogers / Gene Nunes**
Project Mgr.:	**Andrew Kerr, R.G.**	Drilling Method:	**Direct Push / Hollow-Stem Auger**	Sampler Type:	**Macrocore / SPT split spoon**
Reviewed By:	**Andrew Kerr, R.G.**	Drill Rig:	**Marl 5-T (2-in.) / Mobile B-61 (8-in. HSA)**	Total Depth:	**40.5 feet bgs**
Date(s) Drilled:	**6/28/04 and 7/2/04**	Depth to Water:	**Not encountered ATD**	Ground Elevation:	**Not available**

EXPLANATION

Sample Symbols

- Sampled Interval
- Location of Sample Sealed for Analysis
- Location of Sample Held in Laboratory
- No Sample Recovery

- ▽ Water Level During Drilling
- ▼ Water Level After Drilling

[Bay Mud] - Interpreted lithologic unit
FPLH - Free phase liquid hydrocarbons

Contacts

- ——— Solid where certain
- – – – Dashed where approximate

LOG OF BORING BCSU-SB-7

Bulk Container Storage Unit Closure Project
ConocoPhillips San Francisco Refinery, Rodeo, CA
Project Number 1881212.0518

MWH

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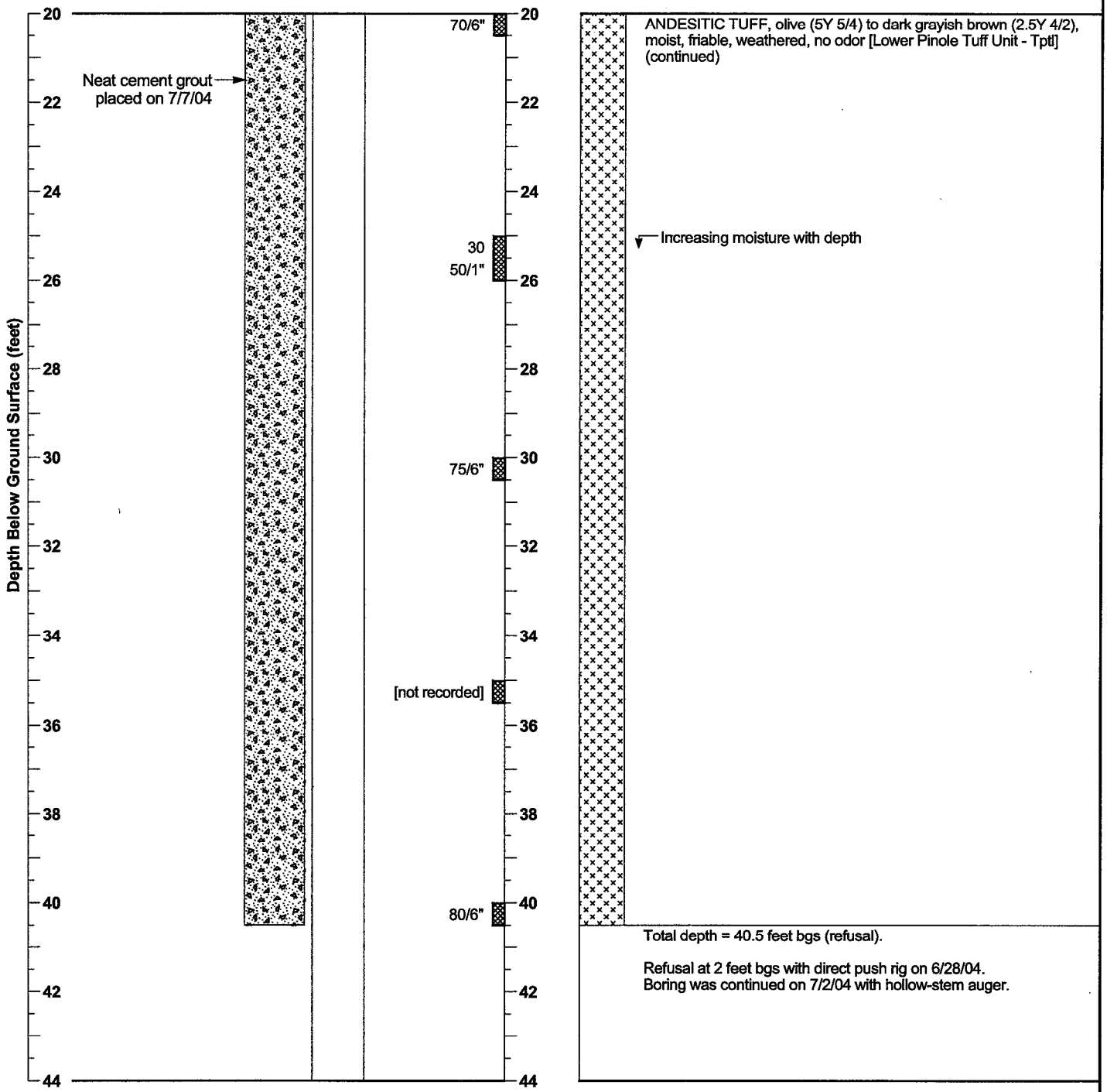
MW_BORING_2AM CPRBULKS.GPJ M_WATSON.GDT 7/30/04



EXPLANATION

Sample Symbols

- Sampled Interval
- Location of Sample Sealed for Analysis
- Location of Sample Held in Laboratory
- No Sample Recovery

- Water Level During Drilling
- Water Level After Drilling

[Bay Mud] - Interpreted lithologic unit
FPLH - Free phase liquid hydrocarbons

Contacts

- ——— Solid where certain
- – – – Dashed where approximate

LOG OF BORING BCSU-SB-7

Bulk Container Storage Unit Closure Project
ConocoPhillips San Francisco Refinery, Rodeo, CA
Project Number 1881212.0518

MWH

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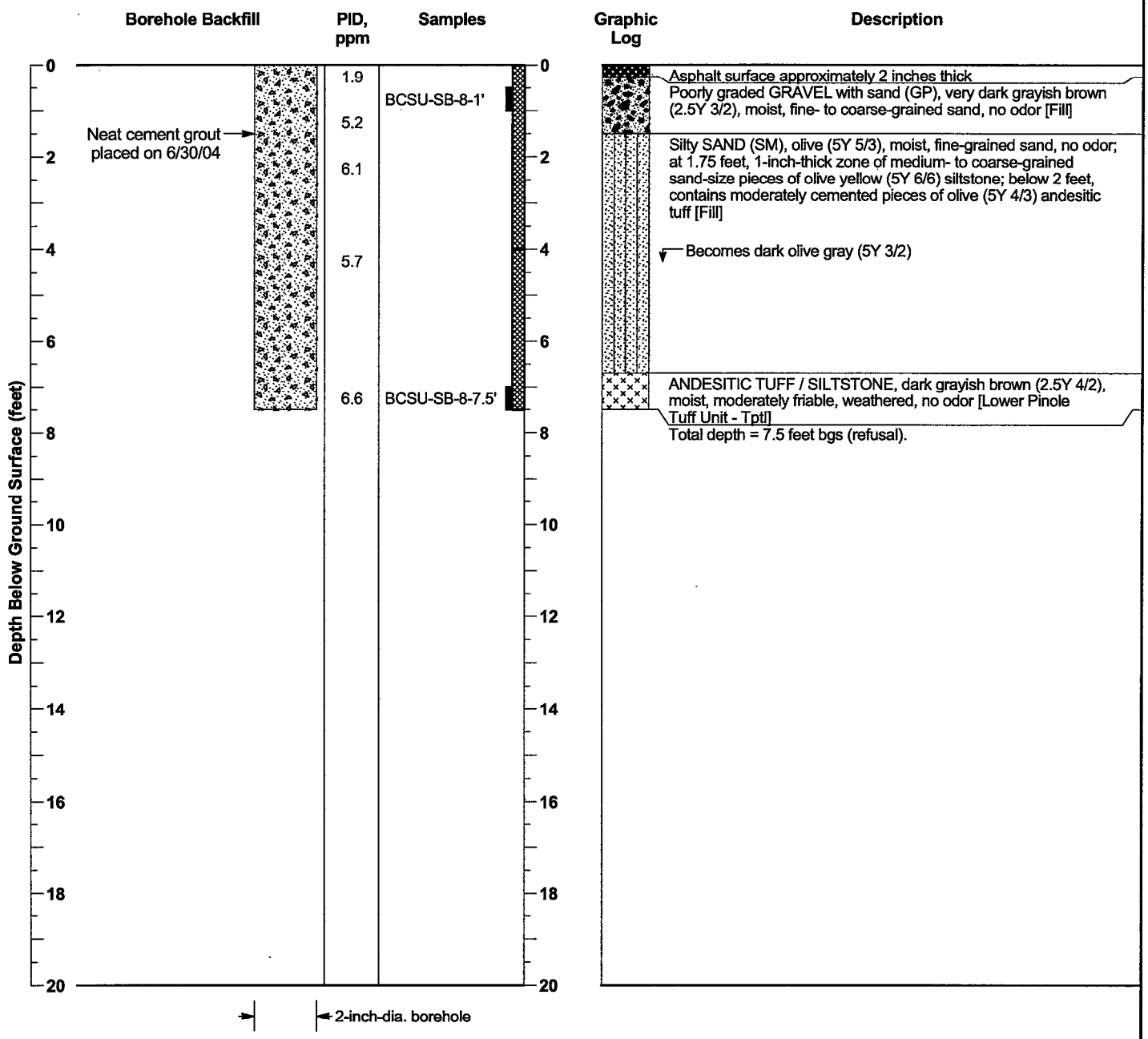
MW_BORING_2AM CPRBULKS.GPJ M_WATSON.GDT 7/30/04



Geologist:	**David Bean**	Drilling Contractor:	**Gregg Drilling & Testing, Inc.**	Driller:	**Paul Rogers**
Project Mgr.:	**Andrew Kerr, R.G.**	Drilling Method:	**Direct Push**	Sampler Type:	**4-foot-long Macrocore**
Reviewed By:	**Andrew Kerr, R.G.**	Drill Rig:	**Marl 5-T (2-inch open drive point)**	Total Depth:	**7.5 feet bgs**
Date(s) Drilled:	**6/28/04**	Depth to Water:	**Not encountered ATD**	Ground Elevation:	**Not available**

EXPLANATION

Sample Symbols

- Sampled Interval
- Location of Sample Sealed for Analysis
- Location of Sample Held in Laboratory
- No Sample Recovery

- ▽ Water Level During Drilling
- ▼ Water Level After Drilling

[Bay Mud] - Interpreted lithologic unit
FPLH - Free phase liquid hydrocarbons

Contacts

- ——— Solid where certain
- — — — Dashed where approximate

LOG OF BORING BCSU-SB-8

Bulk Container Storage Unit Closure Project
ConocoPhillips San Francisco Refinery, Rodeo, CA
Project Number 1881212.0518

MWH

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Appendix C

Statistical Comparison of Compliance and Background Samples

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APPENDIX C

1.0 STATISTICAL COMPARISON OF COMPLIANCE AND BACKGROUND SAMPLES

As discussed in the Phase I Work Plan (MWH, 2003) and the February 27, 2004 Response to the California Department of Toxic Substances Control (DTSC) comments (MWH, 2004a), both compliance and background samples were collected for asphalt, concrete, and soils at the BCSU. The Response-to-Comments document outlined that compliance samples would be statistically evaluated by comparison to the background data set. MWH had originally proposed an Upper Tolerance Limit approach for normal or lognormally distributed datasets, and a non-parametric comparison (such as the Wilcoxon Rank Sum test) for datasets that were not normally or lognormally distributed (MHW, 2004). In response, DTSC requested MWH proceed with a confidence interval approach and/or a non-parametric test, such as the Wilcoxon Rank Sum test, as outlined in the April 26, 2004 Conditional Approval of the Phase I Closure Work Plan (DTSC, 2004). MWH followed the methods requested by DTSC to compare compliance and background datasets as discussed below.

1.1 METHODS

The first step of the statistical comparison was to independently test the compliance and background datasets for each medium using the Shapiro-Wilkes W-test, to determine whether the data fit either a normal or lognormal distribution (Gilbert, 1987; USEPA, 2002). If the W-test was inconclusive or the data fit both normal and lognormal distributions using this test, normal and lognormal probability plots were generated. The correlation coefficient (R^2) was calculated from the normal and lognormal plots. The distribution with the greater R^2 value was chosen as the assumed distribution of the dataset (Gilbert, 1987). Results of the statistical analysis are summarized on Tables C-1 through C-7.

Compliance datasets were then statistically compared to background datasets, using the non-parametric Wilcoxon Rank Sum test, as requested in the DTSC Conditional Approval letter (DTSC, 2004). The Wilcoxon Rank Sums test was performed in accordance with the DTSC guidance document, *Selecting Inorganic Constituents as Chemicals of Potential Concern at Risk Assessments at Hazardous Waste Sites and Permitted Facilities* (DTSC, 1997). The test is applicable for analyzing two data sets drawn from different distributions and is able to handle a moderate number of non-detects by treating them as ties (DTSC, 1997). MWH used the Wilcoxon Rank Sum test to verify whether mean concentrations from compliance datasets are consistently greater or less than mean concentrations in background datasets.

The procedures for performing the Wilcoxon Rank Sum test are outlined below (Gilbert, 1987; DTSC, 1997):

1. Define the null (H_O) and alternative (H_A) hypotheses:

   H_O = The populations from which n_1 and n_2 have been drawn have the same mean.

   H_A = The compliance samples have a higher mean concentration than background.

   Where,

   n_1 = The compliance dataset, and

   n_2 = The background dataset.

2. Consider all $m = n_1 + n_2$ as one dataset. Rank the data from 1 to m, where 1 is assigned to the smallest datum and m is assigned to the largest. If several data have the same value, assigned them the midrank (average of the ranks that would have otherwise been assigned to those data).

3. Sum the ranks assigned to the n_1 measurements from the compliance population. Denote this sum as W_{rs}.

4. Compute the sample statistic Z_{rs}:

$$Zrs = \frac{W_{rs} - \frac{n_1(m+1)}{2}}{\left(\frac{n_1 n_2}{12}\left[m+1-\frac{\sum_{j=1}^{g} t_j(t_j^2-1)}{m(m-1)}\right]\right)}$$

Where,

Z_{rs}	=	The sample statistic
W_{rs}	=	The rank sum of the compliance samples
n_1	=	The number of compliance samples
n_2	=	The number of background samples
m	=	The total number of samples (compliance and background)
g	=	The number of tied groups
t_j	=	The number of tied data in the j^{th} group

5. Reject H_O and accept H_A if $Z_{rs} \geq Z_{1-\alpha}$., where α equals the level of significance. A level of significance of 0.05 was used for the BCSU calculations.

1.2 RESULTS

Based on results of the Wilcoxon Rank Sums test, the following analytes were found to be present in compliance samples at concentrations greater than background:

- Asphalt: beryllium and mercury
- Concrete: barium, beryllium, nickel, and selenium
- Shallow Soil: antimony and mercury
- Deep Soil: cadmium and molybdenum

Arsenic and lead were the only inorganic compound noted at concentrations greater than either Preliminary Remediation Goals (PRGs) or California Regional Water Quality Control Board Environmental Screening Levels for Shallow Soils (ESLs). Arsenic was detected at concentrations above PRGs or ESLs in compliance and background samples

from asphalt, concrete, and soil. Arsenic concentrations in compliance samples were not found to be statistically different than arsenic concentrations in background samples. Lead was detected at concentrations greater than the residential and industrial PRG in two deep soil compliance samples. However, statistical analysis of lead in deep soil did not indicate a statistically significant difference in concentration between compliance and background samples.

Benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, and dibenz(a,h)anthracene were also detected above their respective PRGs and ESLs in selected compliance soil samples.

2.0 REFERENCES

California Department of Toxic Substances Control (DTSC), 2004. *Conditional Approval of the Phase I Closure Work Plan for the Bulk/Container Storage Unit, ConocoPhillips Company, Rodeo, California, EPA ID. No. CAD009108705*. Letter to Mr. Stephan Rosen, Environmental Services Department, ConocoPhillips Company. April 26.

DTSC, 1997. *Selecting Inorganic Constituents as Chemicals of Potential Concern at Risk Assessment at Hazardous Waste Sites and Permitted Facilities – Final Policy.* Prepared by the Human and Ecological Risk Division. February.

Gilbert, R.O., 1987. *Statistical Methods for Environmental Pollution Monitoring*. Van Nostrand Reinhold; New York, New York.

MWH, 2003. *Phase I Closure Work Plan, Bulk/Container Storage Unit, San Francisco Refinery, Rodeo, California*. Prepared for ConocoPhillips Company, Environmental Services Department. August 29.

MWH, 2004a. *Response to Comments, December 11, 2003 & February 11, 2004 Letters, Phase I Closure Work Plan, Bulk/Container Storage Unit, San Francisco Refinery, Rodeo, California, EPA ID Number CAD009108705*. February 27.

United States Environmental Protection Agency (USEPA), 2002. *Guidance for Comparing Background and Chemical Concentration in Soil at CERCLA Sites*. Office of Emergency and Remedial Response, United States Environmental Protection Agency. EPA 540-R-01-003. OSWER 9285.7-41. September.

TABLES

Table C-1
Summary Statistics
Asphalt Compliance Samples
ConocoPhillips Bulk Container Storage Unit Phase I Closure Sampling

Asphalt COPCs (units)	Number of Samples	Number of Detection	Maximum Result	Minimum Result	St dev	Mean	CV	Shapiro-Wilkes Test	Z-Score Plots Normal R^2	Z-Score Plots Lognormal R^2	Assumed Distribution	Wilcoxon Rank Sum Result	T-Test Result
pH	19	19	8.9	5.9	0.86	7.678947	0.11	Normal / Lognormal	0.9546	0.9298	Normal	**Compliance > Background**	Not Applicable[1]
Acetone (µg/kg)	19	7	370	19	84.65	41.14474	2.06	Inconclusive	0.4342	0.6633	Lognormal	No Statistical Difference	Not Applicable[1]
Methylene Chloride (µg/kg)	19	1	29	29	4.46	10.61842	0.42	Inconclusive	0.3092	0.3600	None Assumed	**Compliance < Background**	Not Applicable[1]
2-butanone (µg/kg)	19	3	63	10	15.25	10.13421	1.50	Inconclusive	0.3917	0.4605	None Assumed	No Statistical Difference	Not Applicable[1]
2-hexanone (µg/kg)	19	1	9.1	9.1	1.00	4.997368	0.20	Inconclusive	0.3485	0.4037	None Assumed	No Statistical Difference	Not Applicable[1]
Arsenic (mg/kg)	19	15	3.5	0.30	0.89	0.83	1.08	Lognormal	--	--	Lognormal	**Compliance < Background**	**Compliance < Background**
Barium (mg/kg)	19	19	87	6.50	20.48	23.32	0.88	Lognormal	--	--	Lognormal	No Statistical Difference	No Statistical Difference
Beryllium (mg/kg)	19	17	0.44	0.13	0.12	0.25	0.47	Normal	--	--	Normal	**Compliance > Background**	No Statistical Difference
Chromium (mg/kg)	19	19	34	5.10	7.16	13.00	0.55	Lognormal	--	--	Lognormal	No Statistical Difference	No Statistical Difference
Cobalt (mg/kg)	19	19	19	1.40	5.34	10.36	0.52	Normal	--	--	Normal	No Statistical Difference	No Statistical Difference
Copper (mg/kg)	19	19	230	9.5	48.34	40.53	1.19	Lognormal	--	--	Lognormal	No Statistical Difference	Not Applicable[1]
Lead (mg/kg)	19	19	11	0.41	2.75	2.88	0.95	Lognormal	--	--	Lognormal	No Statistical Difference	Not Applicable[1]
Mercury (mg/kg)	19	17	11	0.064	2.49	0.88	2.81	Lognormal	--	--	Lognormal	**Compliance > Background**	Not Applicable[1]
Molybdenum (mg/kg)	19	5	21	0.84	4.70	1.96	2.40	Inconclusive	0.3414	0.7014	Lognormal	No Statistical Difference	Not Applicable[1]
Nickel (mg/kg)	19	19	49	7.7	11.31	23.78	0.48	Normal / Lognormal	0.9640	0.9721	Lognormal	No Statistical Difference	No Statistical Difference
Selenium (mg/kg)	19	10	24	0.39	2.72	1.16	2.34	Inconclusive	0.3722	0.8667	Lognormal	No Statistical Difference	No Statistical Difference
Silver (mg/kg)	19	1	0.83	0.83	0.24	0.19	1.25	Inconclusive	0.4091	0.5129	None Assumed	No Statistical Difference	Not Applicable[1]
Thallium (mg/kg)	19	1	0.26	0.26	0.18	0.16	1.14	Inconclusive	0.3339	0.5136	None Assumed	No Statistical Difference	Not Applicable[1]
Vanadium (mg/kg)	19	19	130	17	41.55	73.79	0.56	Inconclusive	0.9179	0.9034	Normal	No Statistical Difference	No Statistical Difference
Zinc (mg/kg)	19	19	67	8.6	18.76	40.01	0.47	Normal	--	--	Normal	No Statistical Difference	Not Applicable[1]

COPC - Chemical of Potential Concern
µg/kg - micrograms per kilogram
mg/kg - milligrams per kilogram
St dev - Standard Deviation
CV - Coefficient of Variation
"--" - Not Calculated
R^2 - Correlation Coefficient
1 - T-test not performed due to compliance and background datasets having different assumed distributions.

Table C-2
Summary Statistics
Asphalt Background Samples
ConocoPhillips Bulk Container Storage Unit Phase I Closure Sampling

Asphalt COPCs (units)	Number of Samples	Number of Detection	Maximum Result	Minimum Result	St dev	Mean	CV	Shapiro-Wilkes Test	Z-Score Plots Normal R^2	Z-Score Plots Lognormal R^2	Assumed Distribution
pH	12	12	7.8	6.4	0.43	7.04	0.06	Normal / Lognormal	0.9529	0.9571	Lognormal
Acetone (µg/kg)	12	7	64	19	19.40	26.92	0.72	Normal / Lognormal	0.9446	0.9431	Normal
Methylene Chloride (µg/kg)	12	12	57	24	5.31	29.88	0.18	Normal / Lognormal	0.8725	0.9171	Lognormal
2-butanone (µg/kg)	12	4	15	11	4.17	7.50	0.56	Inconclusive	0.7339	0.7369	Lognormal
2-hexanone (µg/kg)	12	0	<10	<8.9	0.17	4.74	0.04	Normal / Lognormal	0.9957	0.9971	Lognormal
Arsenic	12	12	3.7	0.35	1.00	1.60	0.63	Normal / Lognormal	0.9295	0.9787	Lognormal
Barium (mg/kg)	12	12	78	6.40	22.32	26.24	0.85	Lognormal	--	--	Lognormal
Beryllium (mg/kg)	12	12	0.2	0.11	0.03	0.17	0.18	Inconclusive	0.8591	0.8288	Normal
Chromium (mg/kg)	12	12	29	7.90	6.47	13.85	0.47	Inconclusive	0.8270	0.8773	Lognormal
Cobalt (mg/kg)	12	12	18	4.20	4.62	11.86	0.39	Normal	--	--	Normal
Copper	12	12	38	11	8.00	23.54	0.34	Normal	--	--	Normal
Lead	12	12	4.1	0.76	1.29	2.07	0.62	Inconclusive	0.8692	0.8668	Normal
Mercury	12	11	0.13	0.019	0.04	0.06	0.65	Normal / Lognormal	0.9475	0.9421	Normal
Molybdenum	12	0	<1.1	<0.71	0.06	0.44	0.13	Normal / Lognormal	0.9730	0.9595	Normal
Nickel (mg/kg)	12	12	60	17	10.02	27.46	0.36	Normal / Lognormal	0.8720	0.9450	Lognormal
Selenium	12	12	1.7	0.4	0.33	0.72	0.46	Lognormal	--	--	Lognormal
Silver (mg/kg)	12	0	<0.27	<0.18	0.01	0.11	0.13	Normal / Lognormal	0.9891	0.9802	Normal
Thallium (mg/kg)	12	0	<0.27	<0.18	0.01	0.11	0.13	Normal / Lognormal	0.9891	0.9802	Normal
Vanadium (mg/kg)	12	12	110	17	35.98	71.75	0.50	Inconclusive	0.8585	0.8052	Normal
Zinc (mg/kg)	12	12	150	18	34.05	46.42	0.73	Lognormal	--	--	Lognormal

COPC - Chemical of Potential Concern
µg/kg - micrograms per kilogram
mg/kg - milligrams per kilogram
St dev - Standard Deviation
CV - Coefficient of Variation
"--" - Not Calculated
R^2 - Correlation Coefficient

Table C-3
Summary Statistics
Concrete Compliance Samples
ConocoPhillips Bulk Container Storage Unit Phase I Closure Sampling

Concrete COPCs	Number of Samples	Number of Detection	Max Result (mg/kg)	Min Result (mg/kg)	St dev	Mean	CV	Shapiro-Wilkes Test	Z-Score Plots Normal R^2	Z-Score Plots Lognormal R^2	Assumed Distribution	Wilcoxon Rank Sum Result	T-Test Result
Motor Oil	14	8	550	6.6	143.86	59.64	2.41	Inconclusive	0.4650	0.9458	Lognormal	Not Applicable[1]	Not Applicable[1]
Arsenic	14	14	7.8	3.4	1.61	5.14	0.31	Inconclusive	0.8557	0.8908	Lognormal	No Statistical Difference	No Statistical Difference
Barium	14	14	380	88	99.03	203.29	0.49	Normal / Lognormal	0.9096	0.9387	Lognormal	**Compliance > Background**	**Compliance > Background**
Beryllium	14	14	0.5	0.19	0.09	0.30	0.28	Lognormal	--	--	Lognormal	**Compliance > Background**	**Compliance > Background**
Cadmium	14	12	0.76	0.28	0.15	0.35	0.43	Lognormal	--	--	Lognormal	No Statistical Difference	Not Applicable[2]
Chromium	14	14	61	23	12.23	38.21	0.32	Normal / Lognormal	0.9233	0.9577	Lognormal	No Statistical Difference	No Statistical Difference
Cobalt	14	14	16	6	2.51	8.01	0.31	Inconclusive	0.7660	0.8277	Lognormal	No Statistical Difference	Not Applicable[2]
Copper	14	14	140	12	33.01	33.07	1.00	Inconclusive	0.5811	0.8568	Lognormal	No Statistical Difference	No Statistical Difference
Lead	14	14	9	3.3	1.99	5.68	0.35	Normal / Lognormal	0.9262	0.9388	Lognormal	No Statistical Difference	Not Applicable[2]
Mercury	14	9	0.78	0.021	0.20	0.10	2.08	Lognormal	--	--	Lognormal	No Statistical Difference	No Statistical Difference
Molybdenum	14	8	6.3	1.1	1.91	2.00	0.95	Lognormal	--	--	Lognormal	No Statistical Difference	No Statistical Difference
Nickel	14	14	120	29	23.52	51.14	0.46	Lognormal	--	--	Lognormal	**Compliance > Background**	**Compliance > Background**
Selenium	14	11	1.2	0.39	0.36	0.60	0.60	Normal	--	--	Normal	**Compliance > Background**	Not Applicable[2]
Silver	14	4	0.88	0.52	0.26	0.26	0.98	Inconclusive	0.6665	0.7459	Lognormal	No Statistical Difference	No Statistical Difference
Thallium	14	1	1	1	0.23	0.19	1.26	Inconclusive	0.3336	0.4429	None Assumed	No Statistical Difference	Not Applicable[2]
Vanadium	14	14	230	25	57.28	73.04	0.78	Lognormal	--	--	Lognormal	No Statistical Difference	**Compliance > Background**
Zinc	14	14	250	35	56.63	66.07	0.86	Inconclusive	0.5321	0.7371	Lognormal	No Statistical Difference	No Statistical Difference

COPC - Chemical of Potential Concern
mg/kg - milligrams per kilogram
St dev - Standard Deviation
CV - Coefficient of Variation
"--" - Not Calculated
R^2 - Correlation Coefficient
1 - Statistical comparison to background not applicable, as background samples were not sampled for this COPC.
2 - T-test not performed due to compliance and background datasets having different assumed distributions.

Table C-4
Summary Statistics
Concrete Background Samples
ConocoPhillips Bulk Container Storage Unit Phase I Closure Sampling

Concrete COPCs	Number of Samples	Number of Detection	Max Result (mg/kg)	Min Result (mg/kg)	St dev	Mean	CV	Shapiro-Wilkes Test	Z-Score Plots Normal R^2	Z-Score Plots Lognormal R^2	Assumed Distribution
Motor Oil	2	0	<5.0	<5.0	--	2.50	--	--	--	--	None Assumed
Arsenic	10	10	7.1	2.8	1.38	4.82	0.29	Normal / Lognormal	0.9686	0.9752	Lognormal
Barium	10	10	290	75	65.25	140.70	0.46	Normal / Lognormal	0.8635	0.9603	Lognormal
Beryllium	10	10	0.33	0.14	0.06	0.23	0.26	Normal / Lognormal	0.9576	0.9578	Lognormal
Cadmium	10	8	0.74	0.36	0.19	0.43	0.46	Normal	--	--	Normal
Chromium	10	10	64	19	15.38	33.20	0.46	Lognormal	--	--	Lognormal
Cobalt	10	10	9.2	5	1.33	7.35	0.18	Normal / Lognormal	0.9792	0.9583	Normal
Copper	10	10	58	9.5	16.60	26.15	0.63	Lognormal	--	--	Lognormal
Lead	10	10	9.5	3.5	2.04	6.81	0.30	Normal / Lognormal	0.9702	0.9326	Normal
Mercury	10	7	0.091	0.023	0.03	0.04	0.63	Lognormal	--	--	Lognormal
Molybdenum	10	5	5	0.93	1.77	1.61	1.10	Inconclusive	0.6957	0.8119	Lognormal
Nickel	10	10	60	23	11.73	35.80	0.33	Normal / Lognormal	0.9195	0.9695	Lognormal
Selenium	10	4	1	0.37	0.35	0.36	0.98	Inconclusive	0.7674	0.8002	Lognormal
Silver	10	1	0.64	0.64	0.15	0.24	0.65	Lognormal	--	--	Lognormal
Thallium	10	1	0.64	0.64	0.16	0.17	0.94	Inconclusive	0.3900	0.4494	None Assumed
Vanadium	10	10	85	20	18.36	38.60	0.48	Lognormal	--	--	Lognormal
Zinc	10	10	94	25	21.07	51.50	0.41	Normal / Lognormal	0.9476	0.9879	Lognormal

COPC - Chemical of Potential Concern
mg/kg - milligrams per kilogram
St dev - Standard Deviation
CV - Coefficient of Variation
"--" - Not Calculated
R^2 - Correlation Coefficient

Table C-5
Summary Statistics
Shallow Soil (1 to 3 ft bgs) Compliance Samples
ConocoPhillips Bulk Container Storage Unit Phase I Closure Sampling

Shallow Soil COPCs (units)	Number of Samples	Number of Detection	Maximum Result	Minimum Result	St dev	Mean	CV	Shapiro-Wilkes Test	Z-Score Plots Normal R^2	Z-Score Plots Lognormal R^2	Assumed Distribution	Wilcoxon Rank Sum Result	T-Test Result
pH	11	11	10.8	7.2	0.91	8.26	0.11	Inconclusive	0.6862	0.7374	Lognormal	Not Applicable[1]	Not Applicable[1]
Diesel C10-C24 (mg/kg)	11	10	170	1.80	70.42	52.16	1.35	Lognormal	--	--	Lognormal	Not Applicable[1]	Not Applicable[1]
Motor Oil C24-C36 (mg/kg)	11	10	1600	16	520.25	293.85	1.77	Lognormal	--	--	Lognormal	Not Applicable[1]	Not Applicable[1]
Benzo (b) fluoranthene (µg/kg)	11	6	870	180	252.78	215.68	1.17	Lognormal	--	--	Lognormal	Not Applicable[1]	Not Applicable[1]
Benzo (k) fluoranthene (µg/kg)	11	5	170	820	233.55	178.41	1.31	Lognormal	--	--	Lognormal	Not Applicable[1]	Not Applicable[1]
Chrysene (µg/kg)	11	1	110	110	47.03	67.32	0.70	Inconclusive	0.6978	0.8335	Lognormal	Not Applicable[1]	Not Applicable[1]
Antimony (mg/kg)	11	2	5.3	3.2	1.16	2.15	0.54	Inconclusive	0.6491	0.8691	Lognormal	**Compliance > Background**	**Compliance > Background**
Arsenic (mg/kg)	11	10	4.8	0.83	1.31	1.72	0.76	Normal / Lognormal	0.8543	0.8691	Lognormal	No Statistical Difference	No Statistical Difference
Barium (mg/kg)	11	10	160	17	59.29	81.30	0.73	Normal	--	--	Normal	No Statistical Difference	Not Applicable[2]
Beryllium (mg/kg)	11	9	0.6	0.32	0.19	0.40	0.48	Normal	--	--	Normal	No Statistical Difference	Not Applicable[2]
Chromium (mg/kg)	11	11	23	2.7	7.81	10.93	0.71	Normal	--	--	Normal	No Statistical Difference	Not Applicable[2]
Cobalt (mg/kg)	11	10	30	1.6	9.72	9.01	1.08	Lognormal	--	--	Lognormal	No Statistical Difference	No Statistical Difference
Copper (mg/kg)	11	10	70	5.6	21.45	21.90	0.98	Inconclusive	0.7727	0.7802	Lognormal	No Statistical Difference	Not Applicable[2]
Lead (mg/kg)	11	10	150	1.1	44.33	24.12	1.84	Lognormal	--	--	Lognormal	No Statistical Difference	Not Applicable[2]
Mercury (mg/kg)	11	11	5.3	0.03	1.99	1.16	1.71	Lognormal	--	--	Lognormal	**Compliance > Background**	**Compliance > Background**
Nickel (mg/kg)	11	10	27	2.2	9.15	12.01	0.76	Normal / Lognormal	0.9276	0.8821	Normal	**Compliance < Background**	Not Applicable[2]
Selenium (mg/kg)	11	4	2.1	0.34	0.58	0.39	1.49	Inconclusive	0.4990	0.7732	Lognormal	No Statistical Difference	No Statistical Difference
Thallium (mg/kg)	11	1	0.39	0.39	0.08	0.15	0.55	Inconclusive	0.6617	0.8077	Lognormal	No Statistical Difference	Not Applicable[2]
Vanadium (mg/kg)	11	10	230	5.8	74.66	58.01	1.29	Inconclusive	0.6660	0.8024	Lognormal	No Statistical Difference	Not Applicable[2]
Zinc (mg/kg)	11	10	96	11	27.99	36.69	0.76	Normal	--	--	Normal	No Statistical Difference	No Statistical Difference

COPC - Chemical of Potential Concern
µg/kg - micrograms per kilogram
mg/kg - milligrams per kilogram
St dev - Standard Deviation
CV - Coefficient of Variation
"--" - Not Calculated
R^2 - Correlation Coefficient
1 - Statistical comparison to background not applicable, as background samples were not sampled for this COPC.
2 - T-test not performed due to compliance and background datasets having different assumed distributions.

Table C-6
Summary Statistics
Deep Soil (7.5 to 9 ft bgs) Compliance Samples
ConocoPhillips Bulk Container Storage Unit Phase I Closure Sampling

Deep Soil COPCs (units)	Number of Samples	Number of Detection	Maximum Result	Minimum Result	St dev	Mean	CV	Shapiro-Wilkes Test	Z-Score Plots Normal R^2	Z-Score Plots Lognormal R^2	Assumed Distribution	Wilcoxon Rank Sum Result	T-Test Result
pH	7	7	10.9	5.4	1.68	7.57	0.22	Normal / Lognormal	0.8347	0.8746	Lognormal	Not Applicable[1]	Not Applicable[1]
Diesel C10-C24 (mg/kg)	7	4	81000	1.70	3031.78	1237.10	2.45	Lognormal	--	--	Lognormal	Not Applicable[1]	Not Applicable[1]
Motor Oil C24-C36 (mg/kg)	7	4	43000	6.8	16203.17	6258.11	2.59	Lognormal	--	--	Lognormal	Not Applicable[1]	Not Applicable[1]
2-Methylnaphthalene (µg/kg)	7	2	2700	680	2785.23	1579.57	1.76	Inconclusive	0.6462	0.7995	Lognormal	Not Applicable[1]	Not Applicable[1]
Benzo (a) anthracene (µg/kg)	7	2	2700	670	2785.77	1578.14	1.77	Inconclusive	0.6456	0.7996	Lognormal	Not Applicable[1]	Not Applicable[1]
Chrysene (µg/kg)	7	2	5000	1100	3037.34	1968.14	1.54	Inconclusive	0.7217	0.7806	Lognormal	Not Applicable[1]	Not Applicable[1]
Benzo (b) fluoranthene (µg/kg)	7	3	2600	150	2765.20	1591.86	1.74	Lognormal	--	--	Lognormal	Not Applicable[1]	Not Applicable[1]
Benzo (k) fluoranthene (µg/kg)	7	2	1500	460	2752.33	1376.71	2.00	Inconclusive	0.5607	0.8046	Lognormal	Not Applicable[1]	Not Applicable[1]
Benzo (a) pyrene (µg/kg)	7	2	3500	860	2844.55	1719.57	1.65	Inconclusive	0.6883	0.7927	Lognormal	Not Applicable[1]	Not Applicable[1]
Indeno (1,2,3-cd) pyrene (µg/kg)	7	1	560	560	2789.09	1189.57	2.34	Inconclusive	0.4684	0.7134	Lognormal	Not Applicable[1]	Not Applicable[1]
Dibenz (a,h) anthracene (µg/kg)	7	2	1000	240	2767.56	1273.86	2.17	Inconclusive	0.5111	0.7877	Lognormal	Not Applicable[1]	Not Applicable[1]
Naphthalene (µg/kg)	7	2	1200	300	2761.55	1311.00	2.11	Inconclusive	0.5296	0.7966	Lognormal	Not Applicable[1]	Not Applicable[1]
Phenanthrene (µg/kg)	7	2	980	240	2767.90	1271.00	2.18	Inconclusive	0.5095	0.7875	Lognormal	Not Applicable[1]	Not Applicable[1]
Anthracene (µg/kg)	7	1	450	450	2793.53	1173.86	2.38	Inconclusive	0.4595	0.7045	Lognormal	Not Applicable[1]	Not Applicable[1]
Pyrene (µg/kg)	7	2	1100	300	2762.47	1296.71	2.13	Inconclusive	0.5221	0.7960	Lognormal	Not Applicable[1]	Not Applicable[1]
Benzo (g,h,i) perylene (µg/kg)	7	2	1200	260	2764.03	1305.29	2.12	Inconclusive	0.5273	0.7921	Lognormal	Not Applicable[1]	Not Applicable[1]
Arsenic (mg/kg)	7	6	31	0.67	14.02	9.53	1.34	Lognormal	--	--	Lognormal	No Statistical Difference	No Statistical Difference
Barium (mg/kg)	7	7	190	30	63.56	103.00	0.62	Normal / Lognormal	0.9389	0.9562	Lognormal	No Statistical Difference	No Statistical Difference
Beryllium (mg/kg)	7	6	1.9	0.36	0.58	0.66	0.88	Lognormal	--	--	Lognormal	No Statistical Difference	No Statistical Difference
Cadmium (mg/kg)	7	1	0.57	0.57	0.16	0.21	0.74	Inconclusive	0.5092	0.5980	Lognormal	**Compliance > Background**	No Statistical Difference
Chromium (mg/kg)	7	7	24	2	8.16	11.13	0.73	Normal / Lognormal	0.9361	0.9246	Normal	No Statistical Difference	Not Applicable[2]
Cobalt (mg/kg)	7	7	9.7	2	2.51	5.71	0.44	Normal / Lognormal	0.9839	0.9304	Normal	No Statistical Difference	Not Applicable[2]
Copper (mg/kg)	7	7	65	2.9	21.93	26.29	0.83	Normal / Lognormal	0.9082	0.9282	Lognormal	No Statistical Difference	Not Applicable[2]
Lead (mg/kg)	7	7	1400	3.6	632.99	377.30	1.68	Inconclusive	0.6446	0.7815	Lognormal	No Statistical Difference	Not Applicable[2]
Mercury (mg/kg)	7	6	0.33	0.027	0.11	0.08	1.40	Lognormal	--	--	Lognormal	No Statistical Difference	No Statistical Difference
Molybdenum (mg/kg)	7	3	4.2	1.3	1.56	1.66	0.94	Inconclusive	0.7468	0.8251	Lognormal	**Compliance > Background**	**Compliance > Background**
Nickel (mg/kg)	7	7	170	3.1	60.43	34.13	1.77	Lognormal	--	--	Lognormal	No Statistical Difference	No Statistical Difference
Selenium (mg/kg)	7	1	0.36	0.36	0.08	0.18	0.43	Inconclusive	0.5869	0.6739	Lognormal	No Statistical Difference	No Statistical Difference
Vanadium (mg/kg)	7	7	160	13	50.82	47.14	1.08	Lognormal	--	--	Lognormal	No Statistical Difference	Not Applicable[2]
Zinc (mg/kg)	7	7	80	11	25.06	44.57	0.56	Normal / Lognormal	0.9788	0.9377	Normal	No Statistical Difference	No Statistical Difference

COPC - Chemical of Potential Concern
µg/kg - micrograms per kilogram
mg/kg - milligrams per kilogram
St dev - Standard Deviation
CV - Coefficient of Variation
"--" - Not Calculated
R^2 - Correlation Coefficient
1 - Statistical comparison to background not applicable, as background samples were not sampled for this COPC.
2 - T-test not performed due to compliance and background datasets having different assumed distributions.

Table C-7
Summary Statistics
Soil Background Samples
ConocoPhillips Bulk Container Storage Unit Phase I Closure Sampling

Soil COPCs	Number of Samples	Number of Detection	Max Result (mg/kg)	Min Result (mg/kg)	St dev	Mean	CV	Shapiro-Wilkes Test	Z-Score Plots Normal R^2	Z-Score Plots Lognormal R^2	Assumed Distribution
Antimony	20	0	<3.8	<2.4	0.19	1.53	0.13	Normal / Lognormal	0.9742	0.9826	Lognormal
Arsenic	20	18	10	0.48	2.76	1.94	1.42	Lognormal	--	--	Lognormal
Barium	20	20	240	25.00	62.11	89.30	0.70	Lognormal	--	--	Lognormal
Beryllium	20	20	1	0.26	0.21	0.53	0.40	Normal / Lognormal	0.9111	0.9825	Lognormal
Cadmium	20	0	<0.32	<0.20	0.016	0.13	0.13	Normal / Lognormal	0.9760	0.9868	Lognormal
Chromium	20	20	22	1.70	5.322	7.75	0.69	Normal / Lognormal	0.9227	0.9580	Lognormal
Cobalt	20	20	12	1.60	3.175	5.56	0.57	Lognormal	--	--	Lognormal
Copper	20	20	18	5.40	3.700	11.40	0.32	Normal / Lognormal	0.9577	0.9447	Normal
Lead	20	20	17	2.50	4.39	7.85	0.56	Normal / Lognormal	0.9448	0.9421	Normal
Mercury	20	11	0.021	0.35	0.10	0.08	1.26	Inconclusive	0.7364	0.8865	Lognormal
Molybdenum	20	0	<0.81	<1.3	0.07	0.51	0.13	Normal / Lognormal	0.9677	0.9783	Lognormal
Nickel	20	20	75	3.10	22.90	34.24	0.67	Lognormal	--	--	Lognormal
Selenium	20	7	0.33	0.34	0.15	0.23	0.64	Inconclusive	0.7649	0.8069	Lognormal
Thallium	20	2	0.50	0.42	0.08	0.15	0.53	Inconclusive	0.1449	--	None Assumed
Vanadium	20	20	47	13.00	11.63	29.70	0.39	Inconclusive	0.9256	0.9095	Normal
Zinc	20	20	47	13	11.63	29.7	0.39	Inconclusive	0.9256	0.9095	Normal

COPC - Chemical of Potential Concern
mg/kg - milligrams per kilogram
St dev - Standard Deviation
CV - Coefficient of Variation
"--" - Not Calculated
R^2 - Correlation Coefficient

Appendix D

Quality Assurance/Quality Control Data Review

APPENDIX D

CHEMICAL QUALITY CONTROL SUMMARY REPORT

The following is a summary of the quality control (QC) results and evaluation of chemistry data obtained from the closure activities for the Bulk/Container Storage Unit (BCSU) at the ConocoPhillips San Francisco Refinery (SFR) in Rodeo, California. The following samples were collected and submitted for chemical testing on June 15th through 18th, 21st, 25th, 28th through 30th, 2004 and July 2nd, 7th, and 14th, 2004:

- Thirty-eight (38) soil samples
- Five (5) soil vapor samples
- Five (5) water samples
- Twenty-two (22) concrete samples
- Thirty-five (35) asphalt samples
- Twenty-three (23) wipe samples
- One (1) soap samples
- One (1) washwater samples
- Seven (7) trip blanks (TB)
- Five (5) equipment/field blanks

The objective of the sampling and testing program was to obtain chemical information related to the closure activities at the BCSU area of the SFR.

Curtis and Tompkins, Ltd., Analytical Laboratories, located in Berkeley, California, performed the chemical testing. The samples were tested by one or more of the following methods:

- Volatile organic compounds (VOCs) by EPA method SW 8260B
- VOCs in soil vapor by EPA method TO-14A

- Total petroleum hydrocarbons as gasoline (TPH-g) by California-modified EPA method SW 8015B
- Total petroleum hydrocarbons as diesel (TPH-D) and motor oil (TPH-mo) by California-modified EPA method SW 8015B
- Semivolatile organic compounds (SVOCs) by EPA method SW 8270C
- Polychlorinated biphenyls (PCBs)by EPA method SW 8082
- Title 26 metals by EPA method SW 6010B/7470A/7471A
- Reactivity, corrosivity, and ignitability by EPA methods
- pH by EPA method SW 9040B/9045C

The chemistry results are summarized in Tables 3 through 13. QC data were reviewed for laboratory and instrument precision and accuracy from laboratory control sample/laboratory control sample duplicate (LCS/LCSD) recoveries and relative percent differences (RPDs), matrix spike/matrix spike duplicate (MS/MSD) sample recoveries and RPDs, and surrogate recoveries (organic analyses only). Samples were evaluated for representativeness of laboratory and site conditions based on the review of the method blanks, trip blanks, field blanks, and rinsate blanks. The results were also reviewed for completeness and comparability based on the analytical methods required, sample preservation and holding time criteria specified for each method, and the laboratory reporting limits. In addition, the National Functional Guidelines for Organic Data Review (EPA, 1999) was used to provide overall guidance for the validation process. All qualified data are presented in Table D-1.

Precision and Accuracy

Data were reviewed for precision and accuracy based on the RPDs and recoveries of MS/MSD and LCS/LCSD QC samples and the recoveries of surrogates in the QC and field samples. Data were not qualified in cases where a surrogate recovery was outside the control limit as a result of

sample extract dilution. All surrogate recoveries were within the laboratory-established control limits with the following exceptions:

- The surrogate recovery associated with the VOC analysis of all concrete samples was less than the lower control limit. The results of detected target analytes in the affected samples were qualified as estimated (J), with a low bias. Target compounds that were not detected were qualified as not detected at the estimated reporting limit (UJ) with a low bias.

- The surrogate recoveries associated with the SVOC analysis of all concrete samples were less than the lower control limit. For these samples, at least two of the three acid fraction surrogates had recoveries of less that 10 percent and none were within the normal laboratory control limits. No acid fraction target compounds were detected in the samples however, since the surrogate failures were confirmed to be a result of concrete-specific matrix effects, results were qualified as not detected at the estimated reporting limit (UJ) with a low bias rather than rejected.

- The surrogate recovery associated with the SVOC analysis of one equipment blank sample was less than the lower control limit. Since the other two surrogate recoveries were within the control limits, no qualifiers were necessary.

- The surrogate recovery associated with the SVOC analysis of two soil samples was less than the lower control limit. Since the other two surrogate recoveries were within the control limits, no qualifiers were necessary.

- The surrogate recoveries associated with the SVOC analysis of one soil sample were less than the lower control limit. Since two surrogate recoveries were outside the control limits and no target compounds were detected, results were qualified as not detected at the estimated reporting limit (UJ) with a low bias.

- The surrogate recovery associated with the SVOC analysis of one wipe sample was less than the lower control limit. Since no target analytes were detected in the sample and the other two surrogate recoveries were within the control limits, no qualifiers were necessary.

- The percent recovery for the surrogate compound TCMX associated with the PCB analysis of several concrete samples was less than the lower control limit. The results of detected Aroclors in the affected sample were qualified as estimated (J), with a low bias. Aroclors that were not detected in the sample were qualified as not detected at the estimated reporting limit (UJ) with a low bias due to this non-compliance.

- The surrogate recovery associated with the TPH-D and TPH-mo analysis of two soil samples was higher than the upper control limit. The results for TPH-D and TPH-mo in the affected samples were qualified as estimated (J), with a high bias.

All MS/MSD and LCS/LCSD recoveries and RPDs were within the laboratory-established control limits with the following exceptions:

- The MS and MSD percent recoveries associated with several analyses were outside laboratory control limits. However, in cases where the parent sample is not related to this sample set, then no results were qualified due to this non-conformance.

- The MSD percent recovery associated with the VOC analysis of one batch of asphalt samples was less than the lower control limit for chlorobenzene. This compound was not detected in the parent sample, so the result of the parent sample was qualified as not detected at the estimated reporting limit (UJ), with a low bias.

- The MS and MSD percent recoveries associated with the VOC analysis of one batch of concrete samples were greater than the upper control limit for 1,1-dichloroethene and trichloroethene. This would indicate a high bias, so non-detected results are not qualified since a non-detected result with a high bias is still not detected at the project reporting limit.

- The MS and MSD percent recoveries associated with the metals analysis of one batch of soil samples were greater than the upper control limit for zinc. The result for this compound in the parent sample was qualified as estimated (J) with a high bias.

- The MS and MSD RPD associated with the metals analysis of one batch of soil samples were greater than the control limit for barium. The result for this compound in the parent sample was qualified as estimated (J) with a high bias.

- The LCS and LCSD percent recoveries associated with the SVOC analysis of one batch of wipe samples were greater than the upper control limit for N-nitroso-di-n-propylamine. This compound was not detected in any associated sample, so no qualifiers were necessary.

Field samples were also compared to blind field duplicates to measure precision. In general, RPD results were found to be within the acceptable limits for precision for all matrices and methods. Sample results that were qualified due to the RPD between the field sample and the field duplicate being greater than the control limit of 25 percent are listed in Table D-1. In general, the most qualified analyses and matrices follow:

- Asphalt matrix field duplicate samples had results qualified for metals and VOCs.

- Concrete matrix field duplicate samples had results qualified for metals, TPH, and SVOCs.

- Wipe field duplicate samples had results qualified for metals.
- Soil vapor field duplicate samples had results qualified for VOCs.

All other precision and accuracy results for QC samples were within the laboratory established control limits.

Representativeness

Blank results, including method blanks, trip blanks, field blanks, and rinsate blanks were reviewed for the presence of target analytes for each method performed. Target compounds were not detected at concentrations equal to or greater than reporting limits in any of the blanks with the following exceptions:

- Zinc was detected in an equipment blank associated with one batch of asphalt samples, qualified results are as listed on Table D-1.
- 1,2,4-trichlorobenzene was detected in a method blank associated with one batch of asphalt samples, no results were qualified.
- Acetone and 2-butanone were detected in an equipment blank associated with one batch of asphalt samples, qualified results are as listed on Table D-1.
- Arsenic and zinc were detected in a equipment blank associated with one batch of wipe samples, qualified results are as listed on Table D-1.
- Acetone was detected in an equipment blank associated with one batch of soil samples, no results were qualified.

The soil vapor samples BCSU-SB-3A and BCSU-SB-8A were rejected because the tracer compound (2-propanol) used in the leak tests is interpreted to have infiltrated the samples. The high concentration of 2-propanol found in these samples showed that the samples had been compromised during sampling procedures and all VOC results were rejected as a result.

Completeness and Comparability

The laboratory used standard EPA methodology, reporting limits, and instrumentation to maintain comparability with future data collection activities. Sample preservation and holding times were in compliance with those specified by EPA methods. All other laboratory practices conformed to EPA standards.

Summary of Data Reliability

An evaluation of the precision, accuracy, representativeness, comparability, and completeness of the data generated from the closure activities at the BCSU area of the ConocoPhillips SFR was performed for each analytical method. The results requiring qualification have been summarized on Table D-1. All data are of known and acceptable quality as qualified, based on laboratory-established control limits and the data quality objectives of the project. These data are considered acceptable for their intended uses with the exception of the two soil vapor samples discussed above.

TABLE D-1

SUMMARY OF QUALIFIED DATA
PHASE 1 CLOSURE, BCSU
CONOCOPHILLIPS SAN FRANCISCO REFINERY, RODEO, CALIFORNIA

Laboratory Identification	Sample Identification	Matrix	Method	Parameter	Result	Units	Flag	Bias	Comment
172890-01	ASPBCKG-1	Solid	SW 6010B	Barium	56	mg/kg	J	NDT	Field Duplicate RPD > CL
172890-01	ASPBCKG-1	Solid	SW 6010B	Cobalt	5	mg/kg	J	NDT	Field Duplicate RPD > CL
172890-01	ASPBCKG-1	Solid	SW 6010B	Copper	14	mg/kg	J	NDT	Field Duplicate RPD > CL
172890-01	ASPBCKG-1	Solid	SW 6010B	Lead	2.4	mg/kg	J	NDT	Field Duplicate RPD > CL
172890-01	ASPBCKG-1	Solid	SW 6010B	Nickel	41	mg/kg	J	NDT	Field Duplicate RPD > CL
172890-01	ASPBCKG-1	Solid	SW 6010B	Selenium	0.71	mg/kg	J	NDT	Field Duplicate RPD > CL
172890-01	ASPBCKG-1	Solid	SW 6010B	Vanadium	32	mg/kg	J	NDT	Field Duplicate RPD > CL
172890-01	ASPBCKG-1	Solid	SW 6010B	Zinc	21	mg/kg	J	NDT	Field Duplicate RPD > CL
172890-01	ASPBCKG-1	Solid	SW 8260B	Methylene Chloride	28	mg/kg	J	NDT	Field Duplicate RPD > CL
172925-03	ASP-8	Solid	SW 6010B	Arsenic	0.55	mg/kg	J	NDT	Field Duplicate RPD > CL
172925-03	ASP-8	Solid	SW 6010B	Selenium	0.89	mg/kg	J	NDT	Field Duplicate RPD > CL
172925-03	ASP-8	Solid	SW 8260B	Acetone	26	mg/kg	J	NDT	Field Duplicate RPD > CL
172925-13	CON-1	Solid	SW 8260B	All Target Compounds	< RL	mg/kg	UJ	Low	Surrogate %R < LCL
172925-13	CON-1	Solid	SW 8270B	All Acid Compounds	< RL	mg/kg	UJ	Low	Two or more surrogate %Rs < 10
172925-14	CON-2	Solid	SW 6010B	Cobalt	12	mg/kg	J	NDT	Field Duplicate RPD > CL
172925-14	CON-2	Solid	SW 6010B	Copper	32	mg/kg	J	NDT	Field Duplicate RPD > CL
172925-14	CON-2	Solid	SW 6010B	Molybdenum	3.3	mg/kg	J	NDT	Field Duplicate RPD > CL
172925-14	CON-2	Solid	SW 6010B	Zinc	36	mg/kg	J	NDT	Field Duplicate RPD > CL
172925-14	CON-2	Solid	SW 7471	Mercury	0.035	mg/kg	J	NDT	Field Duplicate RPD > CL
172925-14	CON-2	Solid	SW 8015B	TPH-D	2	mg/kg	J	NDT	Field Duplicate RPD > CL
172925-14	CON-2	Solid	SW 8015B	TPH-MO	6.6	mg/kg	J	NDT	Field Duplicate RPD > CL
172925-14	CON-2	Solid	SW 8260B	All Target Compounds	< RL	mg/kg	UJ	Low	Surrogate %R < LCL
172925-14	CON-2	Solid	SW 8270B	All Acid Compounds	< RL	mg/kg	UJ	Low	Two or more surrogate %Rs < 10
172925-14	CON-2	Solid	SW 8270B	Chrysene	98	mg/kg	J	NDT	Field Duplicate RPD > CL
172925-15	CON-2D	Solid	SW 8260B	All Target Compounds	< RL	mg/kg	UJ	Low	Surrogate %R < LCL
172925-15	CON-2D	Solid	SW 8270B	All Acid Compounds	< RL	mg/kg	UJ	Low	Two or more surrogate %Rs < 10
172956-01	CON-3	Solid	SW 8260B	Acetone	21	mg/kg	J	Low	Surrogate %R < LCL
172956-01	CON-3	Solid	SW 8260B	All non-detected Target Compounds	< RL	mg/kg	UJ	Low	Surrogate %R < LCL
172956-01	CON-3	Solid	SW 8260B	para-isopropyltoluene	16	mg/kg	J	Low	Surrogate %R < LCL
172956-01	CON-3	Solid	SW 8270B	All Acid Compounds	< RL	mg/kg	UJ	Low	Two or more surrogate %Rs < 10
172956-02	CON-3-2.5-4.5	Solid	SW 8260B	All Target Compounds	< RL	mg/kg	UJ	Low	Surrogate %R < LCL
172956-02	CON-3-2.5-4.5	Solid	SW 8270B	All Acid Compounds	< RL	mg/kg	UJ	Low	Two or more surrogate %Rs < 10
172963-02	ASPH-2	Solid	SW 8260B	Chlorobenzene	< 4.5	mg/kg	UJ	Low	MS/MSD %R < LCL
172995-01	ASPH-15	Solid	SW 6010B	Zinc	28	mg/kg	J	High	Blank Contamination
172995-05	ASPH-18	Solid	SW 7471	Mercury	0.97	mg/kg	J	NDT	Field Duplicate RPD > CL
172995-05	ASPH-18	Solid	SW 8260B	2-Butanone	46	mg/kg	J	NDT	Field Duplicate RPD > CL; Blank Contamination
172995-06	ASPH-18D	Solid	SW 6010B	Zinc	47	mg/kg	J	High	Blank Contamination

TABLE D-1

SUMMARY OF QUALIFIED DATA
PHASE 1 CLOSURE, BCSU
CONOCOPHILLIPS SAN FRANCISCO REFINERY, RODEO, CALIFORNIA

Laboratory Identification	Sample Identification	Matrix	Method	Parameter	Result	Units	Flag	Bias	Comment
172995-06	ASPH-18D	Solid	SW 8260B	2-Butanone	63	mg/kg	J	High	Blank Contamination
172995-07	ASPH-12	Solid	SW 6010B	Zinc	43	mg/kg	J	High	Blank Contamination
172995-07	ASPH-12	Solid	SW 8260B	Acetone	24	mg/kg	J	High	Blank Contamination
172995-09	ASPH-13	Solid	SW 6010B	Arsenic	0.32	mg/kg	J	NDT	Field Duplicate RPD > CL
172995-09	ASPH-13	Solid	SW 6010B	Barium	29	mg/kg	J	NDT	Field Duplicate RPD > CL
172995-09	ASPH-13	Solid	SW 6010B	Lead	1.2	mg/kg	J	NDT	Field Duplicate RPD > CL
172995-09	ASPH-13	Solid	SW 6010B	Selenium	0.39	mg/kg	J	NDT	Field Duplicate RPD > CL
172995-09	ASPH-13	Solid	SW 7471	Mercury	0.28	mg/kg	J	NDT	Field Duplicate RPD > CL
172995-11	ASPH-5	Solid	SW 6010B	Zinc	44	mg/kg	J	High	Blank Contamination
172995-11	ASPH-5	Solid	SW 8260B	Acetone	25	mg/kg	J	High	Blank Contamination
172995-12	CON-4	Solid	SW 6010B	Zinc	39	mg/kg	J	High	Blank Contamination
172995-12	CON-4	Solid	SW 8260B	All Target Compounds	< RL	mg/kg	UJ	Low	Surrogate %R < LCL
172995-12	CON-4	Solid	SW 8270B	All Acid Compounds	< RL	mg/kg	UJ	Low	Two or more surrogate %Rs < 10
172995-13	CON-4-1.0-2.5	Solid	SW 6010B	Zinc	35	mg/kg	J	High	Blank Contamination
172995-13	CON-4-1.0-2.5	Solid	SW 8260B	All Target Compounds	< RL	mg/kg	UJ	Low	Surrogate %R < LCL
172995-13	CON-4-1.0-2.5	Solid	SW 8270B	All Acid Compounds	< RL	mg/kg	UJ	Low	Two or more surrogate %Rs < 10
172995-14	CON-5	Solid	SW 6010B	Zinc	42	mg/kg	J	High	Blank Contamination
172995-14	CON-5	Solid	SW 8260B	Acetone	< 20	mg/kg	UJ	NDT	Surrogate %R < LCL; Blank Contamination
172995-14	CON-5	Solid	SW 8260B	All Target Compounds	< RL	mg/kg	UJ	Low	Surrogate %R < LCL
172995-14	CON-5	Solid	SW 8270B	All Acid Compounds	< RL	mg/kg	UJ	Low	Two or more surrogate %Rs < 10
172995-15	CON-6	Solid	SW 8082	Aroclor-1016	< 9.6	mg/kg	UJ	Low	Surrogate %R < LCL
172995-15	CON-6	Solid	SW 8082	Aroclor-1221	< 19	mg/kg	UJ	Low	Surrogate %R < LCL
172995-15	CON-6	Solid	SW 8082	Aroclor-1232	< 9.6	mg/kg	UJ	Low	Surrogate %R < LCL
172995-15	CON-6	Solid	SW 8082	Aroclor-1242	< 9.6	mg/kg	UJ	Low	Surrogate %R < LCL
172995-15	CON-6	Solid	SW 8082	Aroclor-1248	< 9.6	mg/kg	UJ	Low	Surrogate %R < LCL
172995-15	CON-6	Solid	SW 8082	Aroclor-1254	< 9.6	mg/kg	UJ	Low	Surrogate %R < LCL
172995-15	CON-6	Solid	SW 8082	Aroclor-1260	48	mg/kg	J	Low	Surrogate %R < LCL
172995-15	CON-6	Solid	SW 8260B	All Target Compounds	< RL	mg/kg	UJ	Low	Surrogate %R < LCL
172995-15	CON-6	Solid	SW 8270B	All Acid Compounds	< RL	mg/kg	UJ	Low	Two or more surrogate %Rs < 10
172995-16	CON-6D	Solid	SW 8082	Aroclor-1016	< 9.6	mg/kg	UJ	Low	Surrogate %R < LCL
172995-16	CON-6D	Solid	SW 8082	Aroclor-1221	< 19	mg/kg	UJ	Low	Surrogate %R < LCL
172995-16	CON-6D	Solid	SW 8082	Aroclor-1232	< 9.6	mg/kg	UJ	Low	Surrogate %R < LCL
172995-16	CON-6D	Solid	SW 8082	Aroclor-1242	< 9.6	mg/kg	UJ	Low	Surrogate %R < LCL
172995-16	CON-6D	Solid	SW 8082	Aroclor-1248	< 9.6	mg/kg	UJ	Low	Surrogate %R < LCL
172995-16	CON-6D	Solid	SW 8082	Aroclor-1254	< 9.6	mg/kg	UJ	Low	Surrogate %R < LCL
172995-16	CON-6D	Solid	SW 8082	Aroclor-1260	< 9.6	mg/kg	UJ	Low	Surrogate %R < LCL
172995-16	CON-6D	Solid	SW 8260B	All Target Compounds	< RL	mg/kg	UJ	Low	Surrogate %R < LCL
172995-16	CON-6D	Solid	SW 8270B	All Acid Compounds	< RL	mg/kg	UJ	Low	Two or more surrogate %Rs < 10

TABLE D-1

SUMMARY OF QUALIFIED DATA
PHASE 1 CLOSURE, BCSU
CONOCOPHILLIPS SAN FRANCISCO REFINERY, RODEO, CALIFORNIA

Laboratory Identification	Sample Identification	Matrix	Method	Parameter	Result	Units	Flag	Bias	Comment
172995-17	CON-6-1.5-2.0	Solid	SW 8082	Aroclor-1016	< 9.6	mg/kg	UJ	Low	Surrogate %R < LCL
172995-17	CON-6-1.5-2.0	Solid	SW 8082	Aroclor-1221	< 19	mg/kg	UJ	Low	Surrogate %R < LCL
172995-17	CON-6-1.5-2.0	Solid	SW 8082	Aroclor-1232	< 9.6	mg/kg	UJ	Low	Surrogate %R < LCL
172995-17	CON-6-1.5-2.0	Solid	SW 8082	Aroclor-1242	< 9.6	mg/kg	UJ	Low	Surrogate %R < LCL
172995-17	CON-6-1.5-2.0	Solid	SW 8082	Aroclor-1248	< 9.6	mg/kg	UJ	Low	Surrogate %R < LCL
172995-17	CON-6-1.5-2.0	Solid	SW 8082	Aroclor-1254	< 9.6	mg/kg	UJ	Low	Surrogate %R < LCL
172995-17	CON-6-1.5-2.0	Solid	SW 8082	Aroclor-1260	< 9.6	mg/kg	UJ	Low	Surrogate %R < LCL
172995-17	CON-6-1.5-2.0	Solid	SW 8260B	All Target Compounds	< RL	mg/kg	UJ	Low	Surrogate %R < LCL
172995-17	CON-6-1.5-2.0	Solid	SW 8270B	All Acid Compounds	< RL	mg/kg	UJ	Low	Two or more surrogate %Rs < 10
172995-18	CONBCKG-8	Solid	SW 6010B	Zinc	42	mg/kg	J	High	Blank Contamination
172995-18	CONBCKG-8	Solid	SW 8260B	All Target Compounds	< RL	mg/kg	UJ	Low	Surrogate %R < LCL
172995-18	CONBCKG-8	Solid	SW 8270B	All Acid Compounds	< RL	mg/kg	UJ	Low	Two or more surrogate %Rs < 10
172995-19	CON-8	Solid	SW 8260B	Acetone	65	mg/kg	J	NDT	Surrogate %R < LCL; Blank Contamination
172995-19	CON-8	Solid	SW 8260B	All non-detected Target Compounds	< RL	mg/kg	UJ	Low	Surrogate %R < LCL
172995-19	CON-8	Solid	SW 8270B	All Acid Compounds	< RL	mg/kg	UJ	Low	Two or more surrogate %Rs < 10
172995-20	CON-8-1-2.5	Solid	SW 8260B	Acetone	69	mg/kg	J	NDT	Surrogate %R < LCL; Blank Contamination
172995-20	CON-8-1-2.5	Solid	SW 8260B	All non-detected Target Compounds	< RL	mg/kg	UJ	Low	Surrogate %R < LCL
172995-20	CON-8-1-2.5	Solid	SW 8270B	All Acid Compounds	< RL	mg/kg	UJ	Low	Two or more surrogate %Rs < 10
172995-21	CON-9	Solid	SW 6010B	Zinc	42	mg/kg	J	High	Blank Contamination
172995-21	CON-9	Solid	SW 8260B	All Target Compounds	< RL	mg/kg	UJ	Low	Surrogate %R < LCL
172995-21	CON-9	Solid	SW 8270B	All Acid Compounds	< RL	mg/kg	UJ	Low	Two or more surrogate %Rs < 10
172995-22	CON-9D	Solid	SW 6010B	Zinc	42	mg/kg	J	High	Blank Contamination
172995-22	CON-9D	Solid	SW 8260B	All Target Compounds	< RL	mg/kg	UJ	Low	Surrogate %R < LCL
172995-22	CON-9D	Solid	SW 8270B	All Acid Compounds	< RL	mg/kg	UJ	Low	Two or more surrogate %Rs < 10
172995-23	CONBCKG-6	Solid	SW 8260B	All Target Compounds	< RL	mg/kg	UJ	Low	Surrogate %R < LCL
172995-23	CONBCKG-6	Solid	SW 8270B	All Acid Compounds	< RL	mg/kg	UJ	Low	Two or more surrogate %Rs < 10
172995-27	WPBCKG-1	Wipe	SW 6010B	Arsenic	< 0.38	mg/s	UJ	NDT	Blank Contamination
172995-27	WPBCKG-1	Wipe	SW 6010B	Zinc	< 8.4	mg/s	UJ	NDT	Blank Contamination
172995-28	WPBCKG-2	Wipe	SW 6010B	Arsenic	< 0.80	mg/s	UJ	NDT	Blank Contamination
172995-28	WPBCKG-2	Wipe	SW 6010B	Zinc	120	mg/s	J	NDT	Blank Contamination
172995-29	WP-17	Wipe	SW 6010B	Arsenic	< 0.39	mg/s	UJ	NDT	Blank Contamination
172995-29	WP-17	Wipe	SW 6010B	Barium	5.6	mg/s	J	NDT	Field Duplicate RPD > CL
172995-29	WP-17	Wipe	SW 6010B	Chromium	0.86	mg/s	J	NDT	Field Duplicate RPD > CL
172995-29	WP-17	Wipe	SW 6010B	Copper	2.1	mg/s	J	NDT	Field Duplicate RPD > CL
172995-29	WP-17	Wipe	SW 6010B	Lead	1.2	mg/s	J	NDT	Field Duplicate RPD > CL
172995-29	WP-17	Wipe	SW 6010B	Nickel	2.6	mg/s	J	NDT	Field Duplicate RPD > CL
172995-29	WP-17	Wipe	SW 6010B	Vanadium	16	mg/s	J	NDT	Field Duplicate RPD > CL
172995-29	WP-17	Wipe	SW 6010B	Zinc	130	mg/s	J	NDT	Blank Contamination; Field Duplicate RPD > CL

TABLE D-1

SUMMARY OF QUALIFIED DATA
PHASE 1 CLOSURE, BCSU
CONOCOPHILLIPS SAN FRANCISCO REFINERY, RODEO, CALIFORNIA

Laboratory Identification	Sample Identification	Matrix	Method	Parameter	Result	Units	Flag	Bias	Comment
172995-30	WP-17D	Wipe	SW 6010B	Arsenic	< 0.65	mg/s	UJ	NDT	Blank Contamination
172995-30	WP-17D	Wipe	SW 6010B	Zinc	470	mg/s	J	NDT	Blank Contamination
172995-31	WP-8	Wipe	SW 6010B	Arsenic	< 0.37	mg/s	UJ	NDT	Blank Contamination
172995-31	WP-8	Wipe	SW 6010B	Zinc	< 9.3	mg/s	UJ	NDT	Blank Contamination
172995-32	WP-9	Wipe	SW 6010B	Arsenic	< 0.37	mg/s	UJ	NDT	Blank Contamination
172995-32	WP-9	Wipe	SW 6010B	Zinc	< 9.3	mg/s	UJ	NDT	Blank Contamination
172995-33	WP-12	Wipe	SW 6010B	Arsenic	< 0.28	mg/s	UJ	NDT	Blank Contamination
172995-33	WP-12	Wipe	SW 6010B	Zinc	< 7.9	mg/s	UJ	NDT	Blank Contamination
172995-34	WP-14	Wipe	SW 6010B	Arsenic	< 0.33	mg/s	UJ	NDT	Blank Contamination
172995-34	WP-14	Wipe	SW 6010B	Zinc	150	mg/s	J	NDT	Blank Contamination
172995-35	WP-15	Wipe	SW 6010B	Arsenic	< 0.85	mg/s	UJ	NDT	Blank Contamination
172995-35	WP-15	Wipe	SW 6010B	Zinc	< 46	mg/s	UJ	NDT	Blank Contamination
172995-36	WP-7	Wipe	SW 6010B	Arsenic	< 0.33	mg/s	UJ	NDT	Blank Contamination
172995-36	WP-7	Wipe	SW 6010B	Zinc	< 8.9	mg/s	UJ	NDT	Blank Contamination
172995-37	WP-10	Wipe	SW 6010B	Arsenic	< 0.33	mg/s	UJ	NDT	Blank Contamination
172995-37	WP-10	Wipe	SW 6010B	Zinc	< 10	mg/s	UJ	NDT	Blank Contamination
172995-38	WP-11	Wipe	SW 6010B	Arsenic	< 0.29	mg/s	UJ	NDT	Blank Contamination
172995-38	WP-11	Wipe	SW 6010B	Zinc	< 12	mg/s	UJ	NDT	Blank Contamination
172995-39	WP-1	Wipe	SW 6010B	Arsenic	< 1.0	mg/s	UJ	NDT	Blank Contamination
172995-39	WP-1	Wipe	SW 6010B	Zinc	65	mg/s	J	NDT	Blank Contamination
172995-40	WP-2	Wipe	SW 6010B	Arsenic	< 0.85	mg/s	UJ	NDT	Blank Contamination
172995-40	WP-2	Wipe	SW 6010B	Zinc	< 16	mg/s	UJ	NDT	Blank Contamination
172995-41	WP-3	Wipe	SW 6010B	Arsenic	< 0.26	mg/s	UJ	NDT	Blank Contamination
172995-41	WP-3	Wipe	SW 6010B	Zinc	< 8.3	mg/s	UJ	NDT	Blank Contamination
172995-42	WP-4	Wipe	SW 6010B	Arsenic	< 0.26	mg/s	UJ	NDT	Blank Contamination
172995-42	WP-4	Wipe	SW 6010B	Zinc	< 6.7	mg/s	UJ	NDT	Blank Contamination
172995-43	WP-5	Wipe	SW 6010B	Arsenic	< 0.41	mg/s	UJ	NDT	Blank Contamination
172995-43	WP-5	Wipe	SW 6010B	Zinc	< 8.0	mg/s	UJ	NDT	Blank Contamination
172995-44	WP-6	Wipe	SW 6010B	Arsenic	< 0.89	mg/s	UJ	NDT	Blank Contamination
172995-44	WP-6	Wipe	SW 6010B	Zinc	69	mg/s	J	NDT	Blank Contamination
172995-45	WP-16	Wipe	SW 6010B	Arsenic	< 0.81	mg/s	UJ	NDT	Blank Contamination
172995-45	WP-16	Wipe	SW 6010B	Lead	0.18	mg/s	J	NDT	Field Duplicate RPD > CL
172995-45	WP-16	Wipe	SW 6010B	Vanadium	3	mg/s	J	NDT	Field Duplicate RPD > CL
172995-45	WP-16	Wipe	SW 6010B	Zinc	68	mg/s	J	NDT	Blank Contamination; Field Duplicate RPD > CL
172995-46	WP-16D	Wipe	SW 6010B	Zinc	83	mg/s	J	NDT	Blank Contamination
172995-47	WP-18	Wipe	SW 6010B	Zinc	< 26	mg/s	UJ	NDT	Blank Contamination
172995-48	WP-19	Wipe	SW 6010B	Zinc	140	mg/s	J	NDT	Blank Contamination
172995-49	CON-7	Solid	SW 6010B	Zinc	41	mg/kg	J	High	Blank Contamination

TABLE D-1

SUMMARY OF QUALIFIED DATA
PHASE 1 CLOSURE, BCSU
CONOCOPHILLIPS SAN FRANCISCO REFINERY, RODEO, CALIFORNIA

Laboratory Identification	Sample Identification	Matrix	Method	Parameter	Result	Units	Flag	Bias	Comment
172995-49	CON-7	Solid	SW 8260B	All Target Compounds	< RL	mg/kg	UJ	Low	Surrogate %R < LCL
172995-49	CON-7	Solid	SW 8270B	All Acid Compounds	< RL	mg/kg	UJ	Low	Two or more surrogate %Rs < 10
172995-50	CON-10	Solid	SW 6010B	Zinc	39	mg/kg	J	High	Blank Contamination
172995-50	CON-10	Solid	SW 8260B	All Target Compounds	< RL	mg/kg	UJ	Low	Surrogate %R < LCL
172995-50	CON-10	Solid	SW 8270B	All Acid Compounds	< RL	mg/kg	UJ	Low	Two or more surrogate %Rs < 10
173132-10	BCSU-SB-5-8	Soil	SW 8015B	TPH-D	8100	mg/kg	J	High	Surrogate %R > UCL
173132-10	BCSU-SB-5-8	Soil	SW 8015B	TPH-MO	4300	mg/kg	J	High	Surrogate %R > UCL
173132-10	BCSU-SB-6-1	Soil	SW 8015B	TPH-D	3.8	mg/kg	J	High	Surrogate %R > UCL
173132-10	BCSU-SB-6-1	Soil	SW 8015B	TPH-MO	36	mg/kg	J	High	Surrogate %R > UCL
173231-002	BCSU-SB-7-8'	Soil	SW 8270C	Phenol	< 440	µg/kg	UJ	Low	2 acid surrogate %Rs < LCLs
173231-002	BCSU-SB-7-8'	Soil	SW 8270C	2-Chlorophenol	< 440	µg/kg	UJ	Low	2 acid surrogate %Rs < LCLs
173231-002	BCSU-SB-7-8'	Soil	SW 8270C	2-Methylphenol	< 440	µg/kg	UJ	Low	2 acid surrogate %Rs < LCLs
173231-002	BCSU-SB-7-8'	Soil	SW 8270C	4-Methylphenol	< 440	µg/kg	UJ	Low	2 acid surrogate %Rs < LCLs
173231-002	BCSU-SB-7-8'	Soil	SW 8270C	2-Nitrophenol	< 880	µg/kg	UJ	Low	2 acid surrogate %Rs < LCLs
173231-002	BCSU-SB-7-8'	Soil	SW 8270C	2,4-Dimethylphenol	< 440	µg/kg	UJ	Low	2 acid surrogate %Rs < LCLs
173231-002	BCSU-SB-7-8'	Soil	SW 8270C	Benzoic acid	< 2,200	µg/kg	UJ	Low	2 acid surrogate %Rs < LCLs
173231-002	BCSU-SB-7-8'	Soil	SW 8270C	2,4-Dichlorophenol	< 440	µg/kg	UJ	Low	2 acid surrogate %Rs < LCLs
173231-002	BCSU-SB-7-8'	Soil	SW 8270C	4-Chloro-3-methylphenol	< 440	µg/kg	UJ	Low	2 acid surrogate %Rs < LCLs
173231-002	BCSU-SB-7-8'	Soil	SW 8270C	2,4,6-Trichlorophenol	< 440	µg/kg	UJ	Low	2 acid surrogate %Rs < LCLs
173231-002	BCSU-SB-7-8'	Soil	SW 8270C	2,4,5-Trichlorophenol	< 440	µg/kg	UJ	Low	2 acid surrogate %Rs < LCLs
173231-002	BCSU-SB-7-8'	Soil	SW 8270C	2,4-Dinitrophenol	< 2,200	µg/kg	UJ	Low	2 acid surrogate %Rs < LCLs
173231-002	BCSU-SB-7-8'	Soil	SW 8270C	4-Nitrophenol	< 880	µg/kg	UJ	Low	2 acid surrogate %Rs < LCLs
173231-002	BCSU-SB-7-8'	Soil	SW 8270C	4,6-Dinitro-2-methylphenol	< 2,200	µg/kg	UJ	Low	2 acid surrogate %Rs < LCLs
173231-002	BCSU-SB-7-8'	Soil	SW 8270C	Pentachlorophenol	< 880	µg/kg	UJ	Low	2 acid surrogate %Rs < LCLs
173231-002	BCSU-SB-7-8'	Soil	SW 6010B	Barium	140	mg/kg	J	NDT	MS/MSD RPD > CL
173231-002	BCSU-SB-7-8'	Soil	SW 6010B	Zinc	80	mg/kg	J	High	MS/MSD %Rs > UCL
173231-002	BCSU-SB-7-8'	Soil	SW 9045C	pH	10.9	none	J	NDT	Analyzed 3 days past holding time
173231-003	BCSU-SB-6-8'	Soil	SW 9045C	pH	7.7	none	J	NDT	Analyzed 3 days past holding time
173231-004	BCSU-SB-2-8'	Soil	SW 9045C	pH	7.6	none	J	NDT	Analyzed 3 days past holding time
173283-001	BCSU-SB-3W	Water	SW 6020	Nickel	18	µg/L	J	High	ER contained 1.0 µg/L nickel
173283-001	BCSU-SB-3W	Water	SW 6020	Zinc	7.5	µg/L	J	High	ER contained 2.1 µg/L zinc
173283-002	BCSU-SB-7W	Water	SW 6020	Nickel	1.6	µg/L	J	High	ER contained 1.0 µg/L nickel
173283-002	BCSU-SB-7W	Water	SW 6020	Zinc	6.1	µg/L	J	High	ER contained 2.1 µg/L zinc
173179-001	BCSU-SB-3A	Vapor	TO-14A	Tetrahydrofuran	3,600	ppbv	R	High	Laboratory duplicate RPD > 30; laboratory duplicate result less than primary sample; Leak detection compound detected in sample
				2-propanol	980,000	ppbv	R	NDT	Leak detection compound detected in sample
				All Target Compounds	< RL	ppbv	R	NDT	Leak detection compound detected in sample

TABLE D-1

SUMMARY OF QUALIFIED DATA
PHASE 1 CLOSURE, BCSU
CONOCOPHILLIPS SAN FRANCISCO REFINERY, RODEO, CALIFORNIA

Laboratory Identification	Sample Identification	Matrix	Method	Parameter	Result	Units	Flag	Bias	Comment
173179-002	BCSU-SB-4A	Vapor	TO-14A	Acetone	51	ppbv	J	High	Field blank contained 40 ppbv acetone
173179-002	BCSU-SB-4A	Vapor	TO-14A	2-Propanol	550	ppbv	J	High	Field blank contained 250 ppbv 2-propanol
173179-003	BCSU-SB-5A	Vapor	TO-14A	Acetone	140	ppbv	J	High	Field blank contained 40 ppbv acetone
173179-003	BCSU-SB-5A	Vapor	TO-14A	2-Propanol	410	ppbv	J	High	Field blank contained 250 ppbv 2-propanol
173179-004	BCSU-SB-8A	Vapor	TO-14A	Acetone	4,600	ppbv	R	Low	Field duplicate RPD > CL; duplicate result greater than primary sample; Leak detection compound detected in sample
173179-004	BCSU-SB-8A	Vapor	TO-14A	2-Propanol	260,000	ppbv	R	Low	Field duplicate RPD > CL; duplicate result greater than primary sample; Leak detection compound detected in sample
				All Target Compounds	< RL	ppbv	R	NDT	Leak detection compound detected in sample

%R - Percent recovery
CL - control limit
ER - Equipment rinsate sample (field blank)
J - Result is estimated
kg - kilograms
L - liter
L2 - "Level 2" data review
LCL - Lower Control limit
µg - micrograms
mg - milligrams
MS - Matrix spike
MSD - Matrix spike duplicate
NDT - not able to determine bias
ppbv - parts per billion by volume
R - rejected
RPD - Relative percent deviation
s - square area equal to 100 cm^2
TPH - total petroleum hydrocarbons
UCL - Upper Control limit
UJ - The result is not detected; however, the reporting limit value is qualified as estimated

Appendix E

Exposure Point Concentration and Risk Calculation Spreadsheets

Table E-1
Summary Statistics and Derived 95% UCLs
ConocoPhillips Bulk/Container Storage Unit Phase I Closure Sampling
Shallow Soil (1 to 3 ft bgs) Compliance Samples - All Data

Soil COPC	Number of Samples	Number of Detections	Max Detect (mg/kg)	Min Result (mg/kg)	Stdev	Mean	CV	Shapiro-Wilkes Test	D'Agostino's Test	Z-score Plots Normal r^2	Z-score Plots Lognormal r^2	Assumed Distribution	95% UCL (mg/kg)	EPC [a] (mg/kg)
Inorganics														
Antimony	11	2	5.3	3.2	1.2	2.2	0.54	Lognormal	na	0.65	0.87	Lognormal	2.8	**2.8**
Mercury	11	11	5.3	0.03	2.1	1.3	1.7	Lognormal	na	0.59	0.60	Lognormal	18	**5.3**
Polynuclear Aromatic Hydrocarbons														
Benzo(a)pyrene TEQ [b]	11	9	0.46	0.071	0.12	0.13	0.88	Inconclusive	na	0.62	0.84	Lognormal	0.25	**0.25**
Total Petroleum Hydrocarbons														
Diesel C10-C24	11	10	170	<1.4	70	52	1.4	Normal	na	0.72	0.64	Normal	91	**91**
Motor Oil C24-C36	11	10	1,600	<6.8	520	294	1.8	Normal	na	0.60	0.54	Normal	578	**578**

Notes:
95% UCL - 95 percent upper confidence limit (UCL) on the mean concentration
CV - coefficient of variation
EPC - Exposure point concentration
Lognormal r^2 - Correlation coefficient for the lognormal plot
mg/kg - Milligrams per kilogram.
Normal r^2 - Correlation coefficient for the normal plot
Stdev - standard deviation

[a] The lower of the 95 percent upper confidence limit on the mean (95% UCL) or the maximum detected concentration was selected as the exposure point concentration (EPC).

[b] Shapiro-Wilkes distribution test was inconclusive, therefore the Studentized Bootstrap Method was used to determine the 95% UCL in this case.

Table E-2
Summary Statistics and Derived 95% UCLs
ConocoPhillips Bulk/Container Storage Unit Phase I Closure Sampling
Deep Soil (7.5 to 9 ft bgs) Compliance Samples - All Data

Soil Gas COPC	Number of Samples	Number of Detections	Max Detect (mg/kg)	Min Result (mg/kg)	Stdev	Mean	CV	Shapiro-Wilkes Test	D'Agostino's Test	Z-score Plots Normal r^2	Z-score Plots Lognormal r^2	Assumed Distribution	95% UCL (mg/kg)	EPC [a] (mg/kg)
Inorganics														
Cadmium	7	1	0.57	<.27	0.16	0.21	0.74	Lognormal	na	0.51	0.60	Lognormal	0.35	0.35
Molybdenum	7	3	4.2	<1.1	1.6	1.7	0.94	Lognormal	na	0.75	0.83	Lognormal	5.2	4.2
Polynuclear Aromatic Hydrocarbons														
2-Methylnaphthalene	7	2	2.7	<0.086	2.8	1.6	1.8	Lognormal	na	0.65	0.80	Lognormal	1,970	**2.7**
Benzo(a)pyrene TEQ [b]	7	5	4.6	0.075	4.9	2.7	1.8	Inconclusive	na	0.64	0.81	Lognormal	8.4	**4.6**
Benzo(g,h,i)perlyene [b]	7	2	1.2	<0.086	2.8	1.3	2.1	Inconclusive	na	0.53	0.79	Lognormal	2.6	**1.2**
Anthracene [b]	7	1	0.45	<0.086	2.8	1.2	2.4	Inconclusive	na	0.46	0.70	Lognormal	3.1	**0.45**
Benzo(g,h,i)perylene [b]	7	1	0.56	<0.086	2.8	1.2	2.3	Inconclusive	na	0.47	0.72	Lognormal	3.1	**0.56**
Naphthalene [b]	7	2	1.2	<0.086	2.8	1.3	2.1	Inconclusive	na	0.53	0.80	Lognormal	3.1	**1.2**
Phenanthrene [b]	7	2	1.0	<0.086	2.8	1.3	2.2	Inconclusive	na	0.51	0.79	Lognormal	3.2	**1.0**
Pyrene [b]	7	2	1.1	<0.086	2.8	1.3	2.1	Inconclusive	na	0.52	0.80	Lognormal	3.3	**1.1**
Volatile Organic Compounds														
Acetone [b]	7	1	0.05	<28	0.10	0.058	1.7	Inconclusive	na	0.52	0.68	Lognormal	0.041	**0.041**
Total Petroleum Hydrocarbons														
Diesel C10-C24	7	4	8,100	<1.3	3,032	1,237	2.5	Inconclusive	na	0.49	0.85	Lognormal	3,710	**3,710**
Motor Oil C24-C36	7	4	43,000	<6.5	16,203	6,258	2.6	Lognormal	na	0.43	0.82	Lognormal	1,174,778,593,691	**43,000**

Notes:
95% UCL - 95 percent upper confidence limit (UCL) on the mean concentration
CV - coefficient of variation
EPC - Exposure point concentration
Lognormal r^2 - Correlation coefficient for the lognormal plot
mg/kg - Milligrams per kilogram.
Normal r^2 - Correlation coefficient for the normal plot
Stdev - standard deviation

[a] The lower of the 95 percent upper confidence limit on the mean (95% UCL) or the maximum detected concentration was selected as the exposure point concentration (EPC).

[b] Shapiro-Wilkes distribution test was inconclusive, therefore the Studentized Bootstrap Method was used to determine the 95% UCL in this case.

Table E-3
Summary Statistics and Derived 95% UCLs
ConocoPhillips Bulk/Container Storage Unit Phase I Closure Sampling
Shallow Soil (1 to 3 ft bgs) Compliance Samples - Revised Data

Soil COPC	Number of Samples	Number of Detections	Max Detect (mg/kg)	Min Result (mg/kg)	Stdev	Mean	CV	Shapiro-Wilkes Test	D'Agostino's Test	Z-score Plots Normal r^2	Z-score Plots Lognormal r^2	Assumed Distribution	95% UCL (mg/kg)	EPC [a] (mg/kg)
Inorganics														
Antimony	8	2	5.3	<2.6	1.3	2.4	0.55	Lognormal	na	0.74	0.87	Lognormal	3.5	**3.5**
Mercury	8	8	5.3	0.047	2.4	1.6	1.5	Lognormal	na	0.64	0.89	Lognormal	12	**5.3**
Polynuclear Aromatic Hydrocarbons														
Benzo(a)pyrene TEQ [b]	8	6	0.17	0.071	0.035	0.094	0.37	Inconclusive	na	0.84	0.92	Lognormal	0.12	**0.12**
Total Petroleum Hydrocarbons														
Diesel C10-C24	8	7	160	<1.4	54	30	1.8	Lognormal	na	0.59	0.97	Lognormal	1,939	**160**
Motor Oil C24-C36	8	7	260	<6.8	86	70	1.2	Lognormal	na	0.75	0.97	Lognormal	758	**260**

Notes:
95% UCL - 95 percent upper confidence limit (UCL) on the mean concentration
CV - coefficient of variation
EPC - Exposure point concentration
Lognormal r^2 - Correlation coefficient for the lognormal plot
mg/kg - Milligrams per kilogram.
Normal r^2 - Correlation coefficient for the normal plot
Stdev - standard deviation

[a] The lower of the 95 percent upper confidence limit on the mean (95% UCL) or the maximum detected concentration was selected as the exposure point concentration (EPC).

[b] Shapiro-Wilkes distribution test was inconclusive, therefore the Studentized Bootstrap Method was used to determine the 95% UCL in this case.

Table E-4
Summary Statistics and Derived 95% UCLs
ConocoPhillips Bulk/Container Storage Unit Phase I Closure Sampling
Deep Soil (7.5 to 9 ft bgs) Compliance Samples - Revised Data

Soil Gas COPC	Number of Samples	Number of Detections	Max Detect (mg/kg)	Min Result (mg/kg)	Stdev	Mean	CV	Shapiro-Wilkes Test	D'Agostino's Test	Z-score Plots Normal r^2	Z-score Plots Lognormal r^2	Assumed Distribution	95% UCL (mg/kg)	EPC [a] (mg/kg)
Inorganics														
Cadmium	4	1	0.57	<.27	na	na	na	na	na	na	na	na	na	0.57
Molybdenum	4	1	1.3	<1.1	na	na	na	na	na	na	na	na	na	1.3
Polynuclear Aromatic Hydrocarbons														
Benzo(a)pyrene TEQ	4	3	0.088	0.075	na	na	na	na	na	na	na	na	na	0.088
Total Petroleum Hydrocarbons														
Diesel C10-C24	4	1	2	<1.3	na	na	na	na	na	na	na	na	na	1.7
Motor Oil C24-C36	4	1	7	<6.5	na	na	na	na	na	na	na	na	na	6.8

Notes:
95% UCL - 95 percent upper confidence limit (UCL) on the mean concentration
CV - coefficient of variation
EPC - Exposure point concentration
Lognormal r^2 - Correlation coefficient for the lognormal plot
mg/kg - Milligrams per kilogram.
na - Not applicable.
Normal r^2 - Correlation coefficient for the normal plot
Stdev - standard deviation

[a] The lower of the 95 percent upper confidence limit on the mean (95% UCL) or the maximum detected concentration was selected as the exposure point concentration (EPC).

TABLE E-5

CALCULATION OF BENZO(a)PYRENE TOXICITY EQUIVALENTS CONCENTRATION FOR SOIL SAMPLING RESULTS
BULK/CONTAINER STORAGE UNIT
CONOCO PHILLIPS PHASE I CLOSURE SAMPLING - ALL DATA

Sample Identification	Benzo(a)-anthracene	Chrysene	Benzo(b)-fluoranthene	Benzo(k)-fluoranthene	Benzo(a)-pyrene	Indeno(1,2,3-cd) pyrene	Dibenz(a,h)-anthracene	B(a)P TEQ Conc (µg/Kg)
Surface Soil (0 -3 ft bgs)								
BCSU SB-1-1	<88	<88	**190**	**180**	<88	<88	<88	105
BCSU SB-1-3	<91	<91	<91	<91	<91	<91	<91	80
BCSU SB-2-1	<160	<160	**360**	<160	<160	<160	<160	168
BCSU SB-2-3	<87	<87	**190**	**180**	<87	<87	<87	104
BCSU SB-3-1	<72	**110**	<72	<72	<72	<72	<72	64
BCSU SB-4-1	<150	<150	**390**	**340**	<150	<150	<150	189
BCSU SB-5-1	<380	<380	**870**	**820**	<380	<380	<380	464
BCSU SB-6-1	<70	<70	<70	<70	<70	<70	<70	61
BCSU SB-7-1	<71	<71	<71	<71	<71	<71	<71	62
BCSU SB-7-2	<81	<81	<81	<81	<81	<81	<81	71
BCSU SB-8-1	<83	<83	**180**	**170**	<83	<83	<83	99
							Mean:	**133**
							95% UCL:	**250**
Subsurface Soil (>3 - 9 ft bgs)								
BCSU SB-2-8	<91	<91	<91	<91	<91	<91	<91	80
BCSU SB-3-8	**2,700**	**5,000**	**2,600**	**1,500**	**3,500**	**560**	**1,000**	4,626
BCSU SB-4-9	**670**	**1,100**	**760**	**460**	**860**	<180	**240**	1,151
BCSU SB-5-8	<15,000	<15,000	<15,000	<15,000	<15,000	<15,000	<15,000	13,125
BCSU SB-6-8	<86	<86	<86	<86	<86	<86	<86	75
BCSU SB-7-8	<88	<88	**150**	<88	<88	<88	<88	88
BCSU SB-8-7.5	<89	<89	<89	<89	<89	<89	<89	78
							Mean:	**2,746**
							95% UCL:	**8,400**
EPA 9 Residential PRG	620	3,800	620	380	62	620	62	
EPA 9 Industrial PRG	2,100	13,000	2,100	1,300	210	2,100	210	

Notes:
Bold sample result indicates detected compound
Shaded sample result indicates concentration exceeds EPA Region 9 Residential PRG.
< - not detected at indicated reporting limit
UCL - Upper confidence limit.
µg/kg - micrograms per kilogram

TABLE E-6

CALCULATION OF BENZO(a)PYRENE TOXICITY EQUIVALENTS CONCENTRATION FOR SOIL SAMPLING RESULTS
BULK/CONTAINER STORAGE UNIT
CONOCO PHILLIPS PHASE I CLOSURE SAMPLING - REVISED DATA

Sample Identification	Benzo(a)-anthracene	Chrysene	Benzo(b)-fluoranthene	Benzo(k)-fluoranthene	Benzo(a)-pyrene	Indeno(1,2,3-cd) pyrene	Dibenz(a,h)-anthracene	B(a)P TEQ Conc (µg/Kg)
Surface Soil (0 -3 ft bgs)								
BCSU SB-1-1	<88	<88	**190**	**180**	<88	<88	<88	105
BCSU SB-1-3	<91	<91	<91	<91	<91	<91	<91	80
BCSU SB-2-1	<160	<160	**360**	<160	<160	<160	<160	168
BCSU SB-2-3	<87	<87	**190**	**180**	<87	<87	<87	104
BCSU SB-6-1	<70	<70	<70	<70	<70	<70	<70	61
BCSU SB-7-1	<71	<71	<71	<71	<71	<71	<71	62
BCSU SB-7-2	<81	<81	<81	<81	<81	<81	<81	71
BCSU SB-8-1	<83	<83	**180**	**170**	<83	<83	<83	99
							Mean:	**94**
							95% UCL:	**250**
Subsurface Soil (>3 - 9 ft bgs)								
BCSU SB-2-8	<91	<91	<91	<91	<91	<91	<91	80
BCSU SB-6-8	<86	<86	<86	<86	<86	<86	<86	75
BCSU SB-7-8	<88	<88	**150**	<88	<88	<88	<88	88
BCSU SB-8-7.5	<89	<89	<89	<89	<89	<89	<89	78
							Mean:	**80**
							95% UCL:	**na**
EPA 9 Residential PRG	620	3,800	620	380	62	620	62	
EPA 9 Industrial PRG	2,100	13,000	2,100	1,300	210	2,100	210	

Notes:

Bold sample result indicates detected compound
Shaded sample result indicates concentration exceeds EPA Region 9 Residential PRG.
< - not detected at indicated reporting limit
UCL - Upper confidence limit.
µg/kg - micrograms per kilogram

TABLE E-7

CANCER RISK CALCULATIONS FOR A SITE WORKER
ConocoPhillips Bulk/Container Storage Unit Phase I Closure Sampling
Shallow Soil (1 to 3 ft bgs) Compliance Samples - All Data

Constituent	Soil Concentration[a] (mg/kg)	Soil Ingestion Dose (mg/kg-d)	Soil Dermal Dose (mg/kg-d)	Dust Inhalation Dose (mg/kg-d)	Cancer Slope Factor (mg/kg-d)$^{-1}$			Pathway-Specific Cancer Risk			Chemical-Specific Risk
					Oral	Dermal	Inhalation	Soil Ingestion	Dermal	Dust Inhalation	
POLYNUCLEAR AROMATIC HYDROCARBONS											
Benzo(a)pyrene TEQ	0.25	7.9E-08	6.8E-08	1.5E-11	7.3E+00	7.3E+00	7.3E+00	5.8E-07	4.9E-07	1.1E-10	1.1E-06
										ILCR	**1E-06**

Notes:

[a] Based on the maximum or 95 percent upper confidence limit (95% UCL) on the mean concentration detected in deep soil at the site.

1) Doses and cancer risks shown only for carcinogenic chemicals with available toxicity values.
2) Absorbed doses were calculated for dermal contact with the medium, and intakes were calculated for ingestion or inhalation of a medium.
3) Cancer risks are unitless values which represent the probability of incurring an adverse health effect. They are calculated using the following formula: Cancer Risk = Exposure Dose x Cancer Slope Factor.

ILCR	Incremental lifetime cancer risk.
mg/kg	Milligrams per kilogram.
mg/kg-d	Milligrams per kilogram per day.
TEQ	Toxicity Equivalent Factor

TABLE E-8

NONCANCER HAZARD CALCULATIONS FOR A SITE WORKER
ConocoPhillips Bulk/Container Storage Unit Phase I Closure Sampling
Shallow Soil (1 to 3 ft bgs) Compliance Samples - All Data

Constituent	Soil Concentration[a] (mg/kg)	Soil Ingestion Dose (mg/kg-d)	Dermal Dose (mg/kg-d)	Dust Inhalation Dose (mg/kg-d)	Reference Dose (mg/kg-d) Oral	Dermal	Inhalation	Pathway-Specific Hazard Soil Ingestion	Dermal	Dust Inhalation	Chemical-Specific HQ
INORGANICS											
Antimony	2.8	2.4E-06	1.6E-07	4.5E-10	4.0E-04	4.0E-04	4.0E-04	6.1E-03	4.0E-04	1.1E-06	0.0065
Mercury	5.3	4.7E-06	3.1E-07	8.6E-10	3.0E-04	3.0E-04	3.0E-04	1.6E-02	1.0E-03	2.9E-06	0.017
										HI	**0.02**
PETROLEUM HYDROCARBONS											
Diesel C10-C24	91	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]
Diesel C10-C24, Aliphatic	73	6.4E-05	4.2E-05	3.9E-08	1.0E-01	1.0E-01	1.0E-01	6.4E-04	4.2E-04	3.9E-07	0.0011
Diesel C10-C24, Aromatic	36	3.2E-05	2.1E-05	2.0E-08	4.0E-02	4.0E-02	4.0E-02	8.0E-04	5.3E-04	4.9E-07	0.0013
Motor Oil C24-C26	578	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]
Motor Oil C24-C36, Aliphatic	520	4.6E-04	3.9E-04	8.5E-08	2.0E+00	2.0E+00	2.0E+00	2.3E-04	2.0E-04	4.2E-08	0.00043
Motor Oil C24-C36, Aromatic	173	1.5E-04	1.3E-04	2.8E-08	3.0E-02	3.0E-02	3.0E-02	5.1E-03	4.4E-03	9.4E-07	0.0095
										HI	**0.01**

Notes:

[a] Based on the maximum or 95 percent upper confidence limit (95% UCL) on the mean concentration detected in deep soil at the site.

1) Doses and noncancer hazards shown only for noncarcinogenic chemicals with available toxicity values.
2) Absorbed doses were calculated for dermal contact with the medium, and intakes were calculated for ingestion or inhalation of a medium
3) Noncancer hazards are unitless values which represent the probability of incurring an adverse health effect. They are calculated using the following formula: Noncancer HI = Exposure Dose/Reference dose.

HI	Hazard index.
HQ	Hazard quotient.
Inc	Incomplete pathway.
mg/kg	Milligrams per kilogram.
mg/kd-d	Milligrams per kilogram per day.
na	Not applicable.

TABLE E-9

CANCER RISK CALCULATIONS FOR A SITE WORKER
ConocoPhillips Bulk/Container Storage Unit Phase I Closure Sampling
Deep Soil (7.5 to 9 ft bgs) Compliance Samples - All Data

Constituent	Soil Concentration[a] (mg/kg)	Soil Ingestion Dose (mg/kg-d)	Soil Dermal Dose (mg/kg-d)	Dust Inhalation Dose (mg/kg-d)	Cancer Slope Factor (mg/kg-d)$^{-1}$			Pathway-Specific Cancer Risk			Chemical-Specific Risk
					Oral	Dermal	Inhalation	Soil Ingestion	Dermal	Dust Inhalation	
INORGANICS											
Cadmium	0.35	1.1E-07	7.2E-10	2.0E-11	na	na	6.3E+00	na	na	1.3E-10	1.3E-10
POLYNUCLEAR AROMATIC HYDROCARBONS											
Benzo(a)pyrene	4.6	1.5E-06	1.2E-06	2.7E-10	7.3E+00	7.3E+00	7.3E+00	1.1E-05	9.1E-06	2.0E-09	2.0E-05
										ILCR	**2E-05**

Notes:

[a] Based on the maximum or 95 percent upper confidence limit (95% UCL) on the mean concentration detected in deep soil at the site.

1) Doses and cancer risks shown only for carcinogenic chemicals with available toxicity values.
2) Absorbed doses were calculated for dermal contact with the medium, and intakes were calculated for ingestion or inhalation of a medium.
3) Cancer risks are unitless values which represent the probability of incurring an adverse health effect. They are calculated using the following formula: Cancer Risk = Exposure Dose x Cancer Slope Factor.

ILCR	Incremental lifetime cancer risk.
Inc	Incomplete pathway.
mg/kg	Milligrams per kilogram.
mg/kg-d	Milligrams per kilogram per day.
na	Not available.

TABLE E-10

NONCANCER HAZARD CALCULATIONS FOR A SITE WORKER
ConocoPhillips Bulk/Container Storage Unit Phase I Closure Sampling
Deep Soil (7.5 to 9 ft bgs) Compliance Samples - All Data

Constituent	Soil Concentration[a] (mg/kg)	Soil Ingestion Dose (mg/kg-d)	Dermal Dose (mg/kg-d)	Dust Inhalation Dose (mg/kg-d)	Reference Dose (mg/kg-d) Oral	Dermal	Inhalation	Pathway-Specific Hazard Soil Ingestion	Dermal	Dust Inhalation	Chemical-Specific HQ
INORGANICS											
Cadmium	0.35	3.1E-07	2.0E-09	5.7E-11	5.0E-04	5.0E-04	5.0E-04	6.1E-04	4.1E-06	1.1E-07	0.00062
Molybdenum	4.2	3.7E-06	2.4E-07	6.8E-10	5.0E-03	5.0E-03	5.0E-03	7.4E-04	4.9E-05	1.4E-07	0.00079
VOCs											
Acetone	0.041	3.6E-08	2.4E-08	6.7E-12	1.0E-01	1.0E-01	1.0E-01	3.6E-07	2.4E-07	6.7E-11	0.00000060
PAHs											
2-Methylnaphthalene	2.7	2.4E-06	2.0E-06	4.4E-10	2.0E-02	2.0E-02	8.6E-04	1.2E-04	1.0E-04	5.1E-07	0.00022
Anthracene	0.45	4.0E-07	3.4E-07	7.3E-11	3.0E-01	3.0E-01	3.0E-01	1.3E-06	1.1E-06	2.4E-10	0.0000025
Benzo(g,h,i)perylene	0.56	4.9E-07	4.2E-07	9.1E-11	2.0E-02	2.0E-02	8.6E-04	2.5E-05	2.1E-05	1.1E-07	0.000046
Naphthalene	1.2	1.1E-06	9.1E-07	2.0E-10	2.0E-02	2.0E-02	8.6E-04	5.3E-05	4.5E-05	2.3E-07	0.00010
Phenanthrene	0.98	8.6E-07	7.4E-07	1.6E-10	3.0E-01	3.0E-01	3.0E-01	2.9E-06	2.5E-06	5.3E-10	0.0000053
Pyrene	1.1	9.7E-07	8.3E-07	1.8E-10	3.0E-02	3.0E-02	3.0E-02	3.2E-05	2.8E-05	6.0E-09	0.000060
										HI	**0.0018**
PETROLEUM HYDROCARBONS											
Diesel C10-C24	3,710	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]
Diesel C10-C24, Aliphatic	2,968	2.6E-03	1.7E-03	1.6E-06	1.0E-01	1.0E-01	1.0E-01	2.6E-02	1.7E-02	1.6E-05	0.043
Diesel C10-C24, Aromatic	1,484	1.3E-03	8.6E-04	8.0E-07	4.0E-02	4.0E-02	4.0E-02	3.3E-02	2.2E-02	2.0E-05	0.054
Motor Oil C24-C26	43,000	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]
Motor Oil C24-C36, Aliphatic	38,700	3.4E-02	2.9E-02	6.3E-06	2.0E+00	2.0E+00	2.0E+00	1.7E-02	1.5E-02	3.1E-06	0.032
Motor Oil C24-C36, Aromatic	12,900	1.1E-02	9.7E-03	2.1E-06	3.0E-02	3.0E-02	3.0E-02	3.8E-01	3.2E-01	7.0E-05	0.70
										HI	**0.83**

Notes:

[a] Based on the maximum or 95 percent upper confidence limit (95% UCL) on the mean concentration detected in deep soil at the site.

1) Doses and noncancer hazards shown only for noncarcinogenic chemicals with available toxicity values.
2) Absorbed doses were calculated for dermal contact with the medium, and intakes were calculated for ingestion or inhalation of a medium
3) Noncancer hazards are unitless values which represent the probability of incurring an adverse health effect. They are calculated using the following formula: Noncancer HI = Exposure Dose/Reference dose.

HI	Hazard index.
HQ	Hazard quotient.
Inc	Incomplete pathway.
mg/kg	Milligrams per kilogram.
mg/kd-d	Milligrams per kilogram per day.
PAH	Polynuclear aromatic hydrocarbons.
VOC	Volatile organic compounds.

TABLE E-11

CANCER RISK CALCULATIONS FOR A HYPOTHETICAL FUTURE RESIDENT
ConocoPhillips Bulk/Container Storage Unit Phase I Closure Sampling
Shallow Soil (1 to 3 ft bgs) Compliance Samples - All Data

Constituent	Soil Concentration[a] (mg/kg)	Soil Ingestion Dose (mg/kg-d)	Soil Dermal Dose (mg/kg-d)	Dust Inhalation Dose (mg/kg-d)	Cancer Slope Factor $(mg/kg\text{-}d)^{-1}$			Pathway-Specific Cancer Risk			Chemical-Specific Risk
					Oral	Dermal	Inhalation	Soil Ingestion	Dermal	Dust Inhalation	
POLYNUCLEAR AROMATIC HYDROCARBONS											
Benzo(a)pyrene TEQ	0.25	3.9E-07	1.6E-07	2.9E-11	7.3E+00	7.3E+00	7.3E+00	2.9E-06	1.2E-06	2.1E-10	4.0E-06
										ILCR	**4E-06**

Notes:

[a] Based on the maximum or 95 percent upper confidence limit (95% UCL) on the mean concentration detected in deep soil at the site.

1) Doses and cancer risks shown only for carcinogenic chemicals with available toxicity values.
2) Absorbed doses were calculated for dermal contact with the medium, and intakes were calculated for ingestion or inhalation of a medium.
3) Cancer risks are unitless values which represent the probability of incurring an adverse health effect. They are calculated using the following formula: Cancer Risk = Exposure Dose x Cancer Slope Factor.

ILCR	Incremental lifetime cancer risk.
mg/kg	Milligrams per kilogram.
mg/kg-d	Milligrams per kilogram per day.
TEQ	Toxicity Equivalent Factor

TABLE E-12

NONCANCER HAZARD CALCULATIONS FOR A HYPOTHETICAL FUTURE RESIDENTIAL
ConocoPhillips Bulk/Container Storage Unit Phase I Closure Sampling
Shallow Soil (1 to 3 ft bgs) Compliance Samples - All Data

Constituent	Soil Concentration[a] (mg/kg)	Soil Ingestion Dose (mg/kg-d)	Dermal Dose (mg/kg-d)	Dust Inhalation Dose (mg/kg-d)	Reference Dose (mg/kg-d) Oral	Dermal	Inhalation	Pathway-Specific Hazard Soil Ingestion	Dermal	Dust Inhalation	Chemical-Specific HQ
INORGANICS											
Antimony	2.8	5.1E-05	1.6E-06	3.7E-09	5.0E-04	5.0E-04	5.0E-04	1.0E-01	3.2E-03	7.4E-06	0.10
Mercury	5.3	9.7E-05	3.1E-06	7.1E-09	5.0E-03	5.0E-03	5.0E-03	1.9E-02	6.1E-04	1.4E-06	0.020
										HI	**0.1**
PETROLEUM HYDROCARBONS											
Diesel C10-C24	91	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]
Diesel C10-C24, Aliphatic	73	1.3E-03	4.2E-04	9.7E-08	1.0E-01	1.0E-01	1.0E-01	1.3E-02	4.2E-03	9.7E-07	0.017
Diesel C10-C24, Aromatic	36	6.6E-04	2.1E-04	4.8E-08	4.0E-02	4.0E-02	4.0E-02	1.7E-02	5.2E-03	1.2E-06	0.022
Motor Oil C24-C36	578	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]
Motor Oil C24-C36, Aliphatic	520	9.5E-03	3.9E-03	6.9E-07	2.0E+00	2.0E+00	2.0E+00	4.8E-03	2.0E-03	3.5E-07	0.0067
Motor Oil C24-C36, Aromatic	173	3.2E-03	1.3E-03	2.3E-07	3.0E-02	3.0E-02	3.0E-02	1.1E-01	4.3E-02	7.7E-06	0.15
										HI	**0.2**

Notes:

[a] Based on the maximum or 95 percent upper confidence limit (95% UCL) on the mean concentration detected in deep soil at the site.

1) Doses and noncancer hazards shown only for noncarcinogenic chemicals with available toxicity values.
2) Absorbed doses were calculated for dermal contact with the medium, and intakes were calculated for ingestion or inhalation of a medium
3) Noncancer hazards are unitless values which represent the probability of incurring an adverse health effect. They are calculated using the following formula: Noncancer HI = Exposure Dose/Reference dose.

HI	Hazard index.
HQ	Hazard quotient.
mg/kg	Milligrams per kilogram.
mg/kd-d	Milligrams per kilogram per day.
na	Not applicable.

TABLE E-13

CANCER RISK CALCULATIONS FOR A HYPOTHETICAL FUTURE RESIDENT
ConocoPhillips Bulk/Container Storage Unit Phase I Closure Sampling
Deep Soil (7.5 to 9 ft bgs) Compliance Samples - All Data

Constituent	Soil Concentration[a] (mg/kg)	Soil Ingestion Dose (mg/kg-d)	Soil Dermal Dose (mg/kg-d)	Dust Inhalation Dose (mg/kg-d)	Cancer Slope Factor (mg/kg-d)$^{-1}$			Pathway-Specific Cancer Risk			Chemical-Specific Risk
					Oral	Dermal	Inhalation	Soil Ingestion	Dermal	Dust Inhalation	
INORGANICS											
Cadmium	0.35	5.5E-07	1.7E-09	4.0E-11	na	na	6.3E+00	na	na	2.5E-10	2.5E-10
POLYNUCLEAR AROMATIC HYDROCARBONS											
Benzo(a)pyrene TEQ	4.6	7.2E-06	3.0E-06	5.3E-10	7.3E+00	7.3E+00	7.3E+00	5.3E-05	2.2E-05	3.9E-09	7.5E-05
										ILCR	**7E-05**

Notes:

[a] Based on the maximum or 95 percent upper confidence limit (95% UCL) on the mean concentration detected in deep soil at the site.

1) Doses and cancer risks shown only for carcinogenic chemicals with available toxicity values.
2) Absorbed doses were calculated for dermal contact with the medium, and intakes were calculated for ingestion or inhalation of a medium.
3) Cancer risks are unitless values which represent the probability of incurring an adverse health effect. They are calculated using the following formula: Cancer Risk = Exposure Dose x Cancer Slope Factor.

ILCR	Incremental lifetime cancer risk.
mg/kg	Milligrams per kilogram.
mg/kg-d	Milligrams per kilogram per day.
na	Not available.

TABLE E-14

NONCANCER HAZARD CALCULATIONS FOR A HYPOTHETICAL FUTURE RESIDENT
ConocoPhillips Bulk/Container Storage Unit Phase I Closure Sampling
Deep Soil (7.5 to 9 ft bgs) Compliance Samples - All Data

Constituent	Soil Concentration[a] (mg/kg)	Soil Ingestion Dose (mg/kg-d)	Dermal Dose (mg/kg-d)	Dust Inhalation Dose (mg/kg-d)	Reference Dose (mg/kg-d) Oral	Dermal	Inhalation	Pathway-Specific Hazard Soil Ingestion	Dermal	Dust Inhalation	Chemical-Specific HQ
INORGANICS											
Cadmium	0.35	8.3E-06	2.0E-08	4.7E-10	5.0E-04	5.0E-04	5.0E-04	1.7E-02	4.0E-05	9.3E-07	0.017
Molybdenum	4.2	1.0E-04	2.4E-07	5.6E-09	5.0E-03	5.0E-03	5.0E-03	2.0E-02	4.8E-05	1.1E-06	0.020
VOCs											
Acetone	0.041	9.7E-07	2.4E-07	5.5E-11	1.0E-01	1.0E-01	1.0E-01	9.7E-06	2.4E-06	5.5E-10	0.000012
PAHs											
2-Methylnaphthalene	2.7	6.4E-05	2.0E-05	3.6E-09	2.0E-02	2.0E-02	8.6E-04	3.2E-03	1.0E-03	4.2E-06	0.0042
Anthracene	0.45	1.1E-05	3.4E-06	6.0E-10	3.0E-01	3.0E-01	3.0E-01	3.6E-05	1.1E-05	2.0E-09	0.000047
Benzo(g,h,i)perylene	0.56	1.3E-05	4.2E-06	7.5E-10	2.0E-02	2.0E-02	8.6E-04	6.6E-04	2.1E-04	8.7E-07	0.00088
Naphthalene	1.2	2.8E-05	9.0E-06	1.6E-09	2.0E-02	2.0E-02	8.6E-04	1.4E-03	4.5E-04	1.9E-06	0.0019
Phenanthrene	0.98	2.3E-05	7.3E-06	1.3E-09	3.0E-01	3.0E-01	3.0E-01	7.8E-05	2.4E-05	4.4E-09	0.00010
Pyrene	1.1	2.6E-05	8.2E-06	1.5E-09	3.0E-02	3.0E-02	3.0E-02	8.7E-04	2.7E-04	4.9E-08	0.0011
										HI	**0.045**
PETROLEUM HYDROCARBONS											
Diesel C10-C24	3,710	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]
Diesel C10-C24, Aliphatic	2,968	7.0E-02	1.7E-02	4.0E-06	1.0E-01	1.0E-01	1.0E-01	7.0E-01	1.7E-01	4.0E-05	0.88
Diesel C10-C24, Aromatic	1,484	3.5E-02	8.6E-03	2.0E-06	4.0E-02	4.0E-02	4.0E-02	8.8E-01	2.1E-01	5.0E-05	1.1
Motor Oil C24-C36	43,000	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]
Motor Oil C24-C36, Aliphatic	38,700	9.2E-01	2.9E-01	5.2E-05	2.0E+00	2.0E+00	2.0E+00	4.6E-01	1.5E-01	2.6E-05	0.60
Motor Oil C24-C36, Aromatic	12,900	3.1E-01	9.7E-02	1.7E-05	3.0E-02	3.0E-02	3.0E-02	1.0E+01	3.2E+00	5.7E-04	13
										HI	**16**

Notes:

[a] Based on the maximum or 95 percent upper confidence limit (95% UCL) on the mean concentration detected in deep soil at the site.

1) Doses and noncancer hazards shown only for noncarcinogenic chemicals with available toxicity values.
2) Absorbed doses were calculated for dermal contact with the medium, and intakes were calculated for ingestion or inhalation of a medium
3) Noncancer hazards are unitless values which represent the probability of incurring an adverse health effect. They are calculated using the following formula: Noncancer HI = Exposure Dose/Reference dose.

HI	Hazard index.
HQ	Hazard quotient.
mg/kg	Milligrams per kilogram.
mg/kd-d	Milligrams per kilogram per day.
na	Not applicable.
PAH	Polynuclear aromatic hydrocarbons.
VOC	Volatile organic compounds.

TABLE E-15

CANCER RISK CALCULATIONS FOR AN INDUSTRIAL RECEPTOR
ConocoPhillips Bulk/Container Storage Unit Phase I Closure Sampling
Shallow Soil (1 to 3 ft bgs) Compliance Samples - Revised Data

Constituent	Soil Concentration[a] (mg/kg)	Soil Ingestion Dose (mg/kg-d)	Soil Dermal Dose (mg/kg-d)	Dust Inhalation Dose (mg/kg-d)	Cancer Slope Factor (mg/kg-d)$^{-1}$			Pathway-Specific Cancer Risk			Chemical-Specific Risk
					Oral	Dermal	Inhalation	Soil Ingestion	Dermal	Dust Inhalation	
POLYNUCLEAR AROMATIC HYDROCARBONS											
Benzo(a)pyrene TEQ	0.12	3.9E-08	3.3E-08	7.1E-12	7.3E+00	7.3E+00	7.3E+00	2.8E-07	2.4E-07	5.2E-11	5.2E-07
										ILCR	**5E-07**

Notes:

[a] Based on the maximum or 95 percent upper confidence limit (95% UCL) on the mean concentration detected in deep soil at the site.

1) Doses and cancer risks shown only for carcinogenic chemicals with available toxicity values.
2) Absorbed doses were calculated for dermal contact with the medium, and intakes were calculated for ingestion or inhalation of a medium.
3) Cancer risks are unitless values which represent the probability of incurring an adverse health effect. They are calculated using the following formula: Cancer Risk = Exposure Dose x Cancer Slope Factor.

ILCR	Incremental lifetime cancer risk.
mg/kg	Milligrams per kilogram.
mg/kg-d	Milligrams per kilogram per day.
TEQ	Toxicity Equivalent Factor

TABLE E-16

NONCANCER HAZARD CALCULATIONS FOR AN INDUSTRIAL RECEPTOR
ConocoPhillips Bulk/Container Storage Unit Phase I Closure Sampling
Shallow Soil (1 to 3 ft bgs) Compliance Samples - Revised Data

Constituent	Soil Concentration[a] (mg/kg)	Soil Ingestion Dose (mg/kg-d)	Dermal Dose (mg/kg-d)	Dust Inhalation Dose (mg/kg-d)	Reference Dose (mg/kg-d) Oral	Dermal	Inhalation	Pathway-Specific Hazard Soil Ingestion	Dermal	Dust Inhalation	Chemical-Specific HQ
INORGANICS											
Antimony	3.5	3.0E-06	2.0E-07	5.6E-10	4.0E-04	4.0E-04	4.0E-04	7.6E-03	5.0E-04	1.4E-06	0.0081
Mercury	5.3	4.7E-06	3.1E-07	8.6E-10	3.0E-04	3.0E-04	3.0E-04	1.6E-02	1.0E-03	2.9E-06	0.017
										HI	**0.02**
PETROLEUM HYDROCARBONS											
Diesel C10-C24	160	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]
Diesel C10-C24, Aliphatic	128	1.1E-04	7.4E-05	6.9E-08	1.0E-01	1.0E-01	1.0E-01	1.1E-03	7.4E-04	6.9E-07	0.0019
Diesel C10-C24, Aromatic	64	5.6E-05	3.7E-05	3.5E-08	4.0E-02	4.0E-02	4.0E-02	1.4E-03	9.3E-04	8.7E-07	0.0023
Motor Oil C24-C26	260	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]
Motor Oil C24-C36, Aliphatic	234	2.1E-04	1.8E-04	3.8E-08	2.0E+00	2.0E+00	2.0E+00	1.0E-04	8.8E-05	1.9E-08	0.00019
Motor Oil C24-C36, Aromatic	78	6.9E-05	5.9E-05	1.3E-08	3.0E-02	3.0E-02	3.0E-02	2.3E-03	2.0E-03	4.2E-07	0.0043
										HI	**0.01**

Notes:

[a] Based on the maximum or 95 percent upper confidence limit (95% UCL) on the mean concentration detected in deep soil at the site.

1) Doses and noncancer hazards shown only for noncarcinogenic chemicals with available toxicity values.
2) Absorbed doses were calculated for dermal contact with the medium, and intakes were calculated for ingestion or inhalation of a medium
3) Noncancer hazards are unitless values which represent the probability of incurring an adverse health effect. They are calculated using the following formula: Noncancer HI = Exposure Dose/Reference dose.

HI	Hazard index.
HQ	Hazard quotient.
mg/kg	Milligrams per kilogram.
mg/kd-d	Milligrams per kilogram per day.
na	Not applicable.

TABLE E-17

CANCER RISK CALCULATIONS FOR A SITE WORKER
ConocoPhillips Bulk/Container Storage Unit Phase I Closure Sampling
Deep Soil (7.5 to 9 ft bgs) Compliance Samples - Revised Data

Constituent	Soil Concentration[a] (mg/kg)	Soil Ingestion Dose (mg/kg-d)	Soil Dermal Dose (mg/kg-d)	Dust Inhalation Dose (mg/kg-d)	Cancer Slope Factor (mg/kg-d)$^{-1}$			Pathway-Specific Cancer Risk			Chemical-Specific Risk
					Oral	Dermal	Inhalation	Soil Ingestion	Dermal	Dust Inhalation	
INORGANICS											
Cadmium	0.57	1.8E-07	1.2E-09	3.3E-11	na	na	6.3E+00	na	na	2.1E-10	2.1E-10
POLYNUCLEAR AROMATIC HYDROCARBONS											
Benzo(a)pyrene TEQ	0.088	2.8E-08	2.4E-08	5.1E-12	7.3E+00	7.3E+00	7.3E+00	2.0E-07	1.7E-07	3.7E-11	3.7E-07
										ILCR	**4E-07**

Notes:

[a] Based on the maximum or 95 percent upper confidence limit (95% UCL) on the mean concentration detected in deep soil at the site.

1) Doses and cancer risks shown only for carcinogenic chemicals with available toxicity values.
2) Absorbed doses were calculated for dermal contact with the medium, and intakes were calculated for ingestion or inhalation of a medium.
3) Cancer risks are unitless values which represent the probability of incurring an adverse health effect. They are calculated using the following formula: Cancer Risk = Exposure Dose x Cancer Slope Factor.

ILCR	Incremental lifetime cancer risk.
mg/kg	Milligrams per kilogram.
mg/kg-d	Milligrams per kilogram per day.
na	Not available.
TEQ	Total equivalents factor.

TABLE E-18

NONCANCER HAZARD CALCULATIONS FOR A SITE WORKER
ConocoPhillips Bulk/Container Storage Unit Phase I Closure Sampling
Deep Soil (7.5 to 9 ft bgs) Compliance Samples - Revised Data

Constituent	Soil Concentration[a] (mg/kg)	Soil Ingestion Dose (mg/kg-d)	Dermal Dose (mg/kg-d)	Dust Inhalation Dose (mg/kg-d)	Reference Dose (mg/kg-d) Oral	Dermal	Inhalation	Pathway-Specific Hazard Soil Ingestion	Dermal	Dust Inhalation	Chemical-Specific HQ
INORGANICS											
Cadmium	0.57	5.0E-07	3.3E-09	9.3E-11	5.0E-04	5.0E-04	5.0E-04	1.0E-03	6.6E-06	1.9E-07	0.0010
Molybdenum	1.3	1.1E-06	7.6E-08	2.1E-10	5.0E-03	5.0E-03	5.0E-03	2.3E-04	1.5E-05	4.2E-08	0.00024
										HI	**0.0013**
PETROLEUM HYDROCARBONS											
Diesel C10-C24	1.7	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]
Diesel C10-C24, Aliphatic	1.4	1.2E-06	7.9E-07	2.2E-10	1.0E-01	1.0E-01	1.0E-01	1.2E-05	7.9E-06	2.2E-09	0.000020
Diesel C10-C24, Aromatic	0.68	6.0E-07	4.0E-07	1.1E-10	4.0E-02	4.0E-02	4.0E-02	1.5E-05	9.9E-06	2.8E-09	0.000025
Motor Oil C24-C26	6.8	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]
Motor Oil C24-C36, Aliphatic	6.1	5.4E-06	4.6E-06	9.9E-10	2.0E+00	2.0E+00	2.0E+00	2.7E-06	2.3E-06	5.0E-10	0.0000050
Motor Oil C24-C36, Aromatic	2.0	1.8E-06	1.5E-06	3.3E-10	3.0E-02	3.0E-02	3.0E-02	6.0E-05	5.1E-05	1.1E-08	0.00011
										HI	**0.00016**

Notes:

[a] Based on the maximum or 95 percent upper confidence limit (95% UCL) on the mean concentration detected in deep soil at the site.

1) Doses and noncancer hazards shown only for noncarcinogenic chemicals with available toxicity values.
2) Absorbed doses were calculated for dermal contact with the medium, and intakes were calculated for ingestion or inhalation of a medium
3) Noncancer hazards are unitless values which represent the probability of incurring an adverse health effect. They are calculated using the following formula: Noncancer HI = Exposure Dose/Reference dose.

HI	Hazard index.
HQ	Hazard quotient.
mg/kg	Milligrams per kilogram.
mg/kd-d	Milligrams per kilogram per day.
na	Not applicable.
PAH	Polynuclear aromatic hydrocarbons.
VOC	Volatile organic compounds.

TABLE E-19

CANCER RISK CALCULATIONS FOR A HYPOTHETICAL FUTURE RESIDENT
ConocoPhillips Bulk/Container Storage Unit Phase I Closure Sampling
Shallow Soil (1 to 3 ft bgs) Compliance Samples - Revised Data

Constituent	Soil Concentration[a] (mg/kg)	Soil Ingestion Dose (mg/kg-d)	Soil Dermal Dose (mg/kg-d)	Dust Inhalation Dose (mg/kg-d)	Cancer Slope Factor (mg/kg-d)$^{-1}$ Oral	Dermal	Inhalation	Pathway-Specific Cancer Risk Soil Ingestion	Dermal	Dust Inhalation	Chemical-Specific Risk
POLYNUCLEAR AROMATIC HYDROCARBONS											
Benzo(a)pyrene TEQ	0.12	1.9E-07	7.9E-08	1.4E-11	7.3E+00	7.3E+00	7.3E+00	1.4E-06	5.7E-07	1.0E-10	2.0E-06
										ILCR	**2E-06**

Notes:

[a] Based on the maximum or 95 percent upper confidence limit (95% UCL) on the mean concentration detected in deep soil at the site.

1) Doses and cancer risks shown only for carcinogenic chemicals with available toxicity values.
2) Absorbed doses were calculated for dermal contact with the medium, and intakes were calculated for ingestion or inhalation of a medium.
3) Cancer risks are unitless values which represent the probability of incurring an adverse health effect. They are calculated using the following formula: Cancer Risk = Exposure Dose x Cancer Slope Factor.

ILCR	Incremental lifetime cancer risk.
Inc	Incomplete pathway.
mg/kg	Milligrams per kilogram.
mg/kg-d	Milligrams per kilogram per day.
TEQ	Total equivalency factor.

TABLE E-20

NONCANCER HAZARD CALCULATIONS FOR A HYPOTHETICAL FUTURE RESIDENTIAL
ConocoPhillips Bulk/Container Storage Unit Phase I Closure Sampling
Shallow Soil (1 to 3 ft bgs) Compliance Samples - Revised Data

Constituent	Soil Concentration[a] (mg/kg)	Soil Ingestion Dose (mg/kg-d)	Dermal Dose (mg/kg-d)	Dust Inhalation Dose (mg/kg-d)	Reference Dose (mg/kg-d) Oral	Dermal	Inhalation	Pathway-Specific Hazard Soil Ingestion	Dermal	Dust Inhalation	Chemical-Specific HQ
INORGANICS											
Antimony	3.5	6.3E-05	2.0E-06	4.6E-09	5.0E-04	5.0E-04	5.0E-04	1.3E-01	4.0E-03	9.2E-06	0.13
Mercury	5.3	9.7E-05	3.1E-06	7.1E-09	5.0E-03	5.0E-03	5.0E-03	1.9E-02	6.1E-04	1.4E-06	0.020
										HI	**0.2**
PETROLEUM HYDROCARBONS											
Diesel C10-C24	160	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]
Diesel C10-C24, Aliphatic	128	2.3E-03	7.4E-04	1.7E-07	1.0E-01	1.0E-01	1.0E-01	2.3E-02	7.4E-03	1.7E-06	0.031
Diesel C10-C24, Aromatic	64	1.2E-03	3.7E-04	8.5E-08	4.0E-02	4.0E-02	4.0E-02	2.9E-02	9.2E-03	2.1E-06	0.038
Motor Oil C24-C36	260	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]
Motor Oil C24-C36, Aliphatic	234	4.3E-03	1.3E-03	3.1E-07	2.0E+00	2.0E+00	2.0E+00	2.1E-03	6.7E-04	1.6E-07	0.0028
Motor Oil C24-C36, Aromatic	78	1.4E-03	4.5E-04	1.0E-07	3.0E-02	3.0E-02	3.0E-02	4.7E-02	1.5E-02	3.5E-06	0.062
										HI	**0.1**

Notes:

[a] Based on the maximum or 95 percent upper confidence limit (95% UCL) on the mean concentration detected in deep soil at the site.

1) Doses and noncancer hazards shown only for noncarcinogenic chemicals with available toxicity values.
2) Absorbed doses were calculated for dermal contact with the medium, and intakes were calculated for ingestion or inhalation of a medium
3) Noncancer hazards are unitless values which represent the probability of incurring an adverse health effect. They are calculated using the following formula: Noncancer HI = Exposure Dose/Reference dose.

HI	Hazard index.
HQ	Hazard quotient.
mg/kg	Milligrams per kilogram.
mg/kd-d	Milligrams per kilogram per day.
na	Not applicable.

TABLE E-21

CANCER RISK CALCULATIONS FOR A HYPOTHETICAL FUTURE RESIDENT
ConocoPhillips Bulk/Container Storage Unit Phase I Closure Sampling
Deep Soil (7.5 to 9 ft bgs) Compliance Samples - Revised Data

Constituent	Soil Concentration[a] (mg/kg)	Soil Ingestion Dose (mg/kg-d)	Soil Dermal Dose (mg/kg-d)	Dust Inhalation Dose (mg/kg-d)	Cancer Slope Factor $(mg/kg\text{-}d)^{-1}$			Pathway-Specific Cancer Risk			Chemical-Specific Risk
					Oral	Dermal	Inhalation	Soil Ingestion	Dermal	Dust Inhalation	
INORGANICS											
Cadmium	0.57	8.9E-07	2.8E-09	6.5E-11	na	na	6.3E+00	na	na	4.1E-10	4.1E-10
POLYNUCLEAR AROMATIC HYDROCARBONS											
Benzo(a)pyrene TEQ	0.088	1.4E-07	5.6E-08	1.0E-11	7.3E+00	7.3E+00	7.3E+00	1.0E-06	4.1E-07	7.3E-11	1.4E-06
										ILCR	**1E-06**

Notes:

[a] Based on the maximum or 95 percent upper confidence limit (95% UCL) on the mean concentration detected in deep soil at the site.

1) Doses and cancer risks shown only for carcinogenic chemicals with available toxicity values.
2) Absorbed doses were calculated for dermal contact with the medium, and intakes were calculated for ingestion or inhalation of a medium.
3) Cancer risks are unitless values which represent the probability of incurring an adverse health effect. They are calculated using the following formula: Cancer Risk = Exposure Dose x Cancer Slope Factor.

ILCR	Incremental lifetime cancer risk.
mg/kg	Milligrams per kilogram.
mg/kg-d	Milligrams per kilogram per day.
na	Not available.
TEQ	Total equivalency factor.

TABLE E-22

NONCANCER HAZARD CALCULATIONS FOR A HYPOTHETICAL FUTURE RESIDENTIAL
ConocoPhillips Bulk/Container Storage Unit Phase I Closure Sampling
Deep Soil (7.5 to 9 ft bgs) Compliance Samples - Revised Data

Constituent	Soil Concentration[a] (mg/kg)	Soil Ingestion Dose (mg/kg-d)	Dermal Dose (mg/kg-d)	Dust Inhalation Dose (mg/kg-d)	Reference Dose (mg/kg-d) Oral	Dermal	Inhalation	Pathway-Specific Hazard Soil Ingestion	Dermal	Dust Inhalation	Chemical-Specific HQ
INORGANICS											
Cadmium	0.57	1.4E-05	3.3E-08	7.6E-10	5.0E-04	5.0E-04	5.0E-04	2.7E-02	6.6E-05	1.5E-06	0.027
Molybdenum	1.3	3.1E-05	4.9E-07	1.7E-09	5.0E-03	5.0E-03	5.0E-03	6.2E-03	9.9E-05	3.5E-07	0.0063
										HI	**0.03**
PETROLEUM HYDROCARBONS											
Diesel C10-C24	1.7	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]
Diesel C10-C24, Aliphatic	1.4	3.2E-05	7.8E-06	1.8E-09	1.0E-01	1.0E-01	1.0E-01	3.2E-04	7.8E-05	1.8E-08	0.00040
Diesel C10-C24, Aromatic	0.68	1.6E-05	3.9E-06	9.1E-10	4.0E-02	4.0E-02	4.0E-02	4.0E-04	9.8E-05	2.3E-08	0.00050
Motor Oil C24-C36	6.8	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]	na[f]
Motor Oil C24-C36, Aliphatic	6.1	1.5E-04	3.5E-05	8.2E-09	2.0E+00	2.0E+00	2.0E+00	7.3E-05	1.8E-05	4.1E-09	0.000090
Motor Oil C24-C36, Aromatic	2.0	4.8E-05	1.2E-05	2.7E-09	3.0E-02	3.0E-02	3.0E-02	1.6E-03	3.9E-04	9.1E-08	0.0020
										HI	**0.003**

Notes:

[a] Based on the maximum or 95 percent upper confidence limit (95% UCL) on the mean concentration detected in deep soil at the site.

1) Doses and noncancer hazards shown only for noncarcinogenic chemicals with available toxicity values.
2) Absorbed doses were calculated for dermal contact with the medium, and intakes were calculated for ingestion or inhalation of a medium
3) Noncancer hazards are unitless values which represent the probability of incurring an adverse health effect. They are calculated using the following formula: Noncancer HI = Exposure Dose/Reference dose.

HI	Hazard index.
HQ	Hazard quotient.
mg/kg	Milligrams per kilogram.
mg/kd-d	Milligrams per kilogram per day.
na	Not applicable.

Table E-23

Johnson-Ettinger Vapor Intrusion Model for a Site Worker
ConocoPhillips Bulk/Container Storage Unit Phase I Closure Sampling
Data Entry Sheet

SG-ADV Version 2.0; 02/03

Reset to Defaults

DTSC / HERD
Version 2.0-mod1; 07/03

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
630206	4.70E+02			1,1,1,2-Tetrachloroethane

MORE

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of Ls (cell F24)					
15	274	20	274			LS		

MORE

ENTER Stratum A SCS soil type	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
Lookup Soil Parameters				Lookup Soil Parameters				Lookup Soil Parameters			
LS	1.66	0.375	0.054	S	1.66	0.375	0.054	S	1.66	0.375	0.054

MORE

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	366	0.1	0.25	

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	25	25	250

END

Table E-23

Johnson-Ettinger Vapor Intrusion Model for a Site Worker
ConocoPhillips Bulk/Container Storage Unit Phase I Closure Sampling
Results Sheet

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
3.2E-06	1.5E-03

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

MESSAGE: Risk/HQ or risk-based soil concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"

END

Table E-24

Johnson-Ettinger Vapor Intrusion Model for a Hypothetical Future Resident
ConocoPhillips Bulk/Container Storage Unit Phase I Closure Sampling
Data Entry Sheet

SG-ADV Version 2.0; 02/03

Reset to Defaults

DTSC / HERD
Version 2.0-mod1; 07/03

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
630206	4.70E+02			1,1,1,2-Tetrachloroethane

MORE

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Totals must add up to value of Ls (cell F24) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
15	274	20	274			LS		

MORE

ENTER Stratum A SCS soil type (Lookup Soil Parameters)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type (Lookup Soil Parameters)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type (Lookup Soil Parameters)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
LS	1.66	0.375	0.054	S	1.66	0.375	0.054	S	1.66	0.375	0.054

MORE

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	366	0.1	0.25	

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

Table E-24

Johnson-Ettinger Vapor Intrusion Model for a Hypothetical Future Resident
ConocoPhillips Bulk/Container Storage Unit Phase I Closure Sampling
Results Sheet

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
5.3E-06	2.0E-03

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

MESSAGE: Risk/HQ or risk-based soil concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"

END

Table E-25

Johnson-Ettinger Vapor Intrusion Model for a Site Worker
ConocoPhillips Bulk/Container Storage Unit Phase I Closure Sampling
Data Entry Sheet

SG-ADV
Version 2.0; 02/03

Reset to Defaults

DTSC / HERD
Version 2.0-mod1; 07/03

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
67641	2.35E+04			Acetone

MORE

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Totals must add up to value of Ls (cell F24) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
15	244	20	244			LS		

MORE

ENTER Stratum A SCS soil type (Lookup Soil Parameters)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type (Lookup Soil Parameters)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type (Lookup Soil Parameters)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
LS	1.66	0.375	0.054	S	1.66	0.375	0.054	S	1.66	0.375	0.054

MORE

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	366	0.1	0.25	

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	25	25	250

END

Table E-25

Johnson-Ettinger Vapor Intrusion Model for a Site Worker
ConocoPhillips Bulk/Container Storage Unit Phase I Closure Sampling
Results Sheet

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	2.5E-02

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

MESSAGE: Risk/HQ or risk-based soil concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"

END

Table E-26

Johnson-Ettinger Vapor Intrusion Model for a Hypothetical Future Resident
ConocoPhillips Bulk/Container Storage Unit Phase I Closure Sampling
Data Entry Sheet

SG-ADV Version 2.0; 02/03

Reset to Defaults

DTSC / HERD
Version 2.0-mod1; 07/03

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
67641	2.35E+04			Acetone

MORE

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of Ls (cell F24)					
15	244	20	244			LS		

MORE

ENTER Stratum A SCS soil type (Lookup Soil Parameters)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type (Lookup Soil Parameters)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type (Lookup Soil Parameters)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
LS	1.66	0.375	0.054	S	1.66	0.375	0.054	S	1.66	0.375	0.054

MORE

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	366	0.1	0.25	

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

Table E-26

Johnson-Ettinger Vapor Intrusion Model for a Hypothetical Future Resident
ConocoPhillips Bulk/Container Storage Unit Phase I Closure Sampling
Results Sheet

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	3.5E-02

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

MESSAGE: Risk/HQ or risk-based soil concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"

END

Table E-27

Johnson-Ettinger Vapor Intrusion Model for a Site Worker
ConocoPhillips Bulk/Container Storage Unit Phase I Closure Sampling
Data Entry Sheet

SG-ADV
Version 2.0; 02/03

Reset to Defaults

DTSC / HERD
Version 2.0-mod1; 07/03

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
75150	6.30E+00			Carbon disulfide

MORE

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of Ls (cell F24)					
15	244	20	244			LS		

MORE

ENTER Stratum A SCS soil type (Lookup Soil Parameters)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type (Lookup Soil Parameters)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type (Lookup Soil Parameters)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
LS	1.66	0.375	0.054	S	1.66	0.375	0.054	S	1.66	0.375	0.054

MORE

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	366	0.1	0.25	

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	25	25	250

END

Table E-27

Johnson-Ettinger Vapor Intrusion Model for a Site Worker
ConocoPhillips Bulk/Container Storage Unit Phase I Closure Sampling
Results Sheet

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	2.8E-06

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

END

Table E-28

Johnson-Ettinger Vapor Intrusion Model for a Hypothetical Future Resident
ConocoPhillips Bulk/Container Storage Unit Phase I Closure Sampling
Data Entry Sheet

SG-ADV
Version 2.0; 02/03

Reset to Defaults

DTSC / HERD
Version 2.0-mod1; 07/03

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
75150	6.30E+00			Carbon disulfide

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Totals must add up to value of Ls (cell F24) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
15	244	20	244			LS		

MORE ↓

ENTER Stratum A SCS soil type (Lookup Soil Parameters)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type (Lookup Soil Parameters)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type (Lookup Soil Parameters)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
LS	1.66	0.375	0.054	S	1.66	0.375	0.054	S	1.66	0.375	0.054

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	366	0.1	0.25	

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

Table E-28

Johnson-Ettinger Vapor Intrusion Model for a Hypothetical Future Resident
ConocoPhillips Bulk/Container Storage Unit Phase I Closure Sampling
Results Sheet

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	4.0E-06

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

END

Table E-29

Johnson-Ettinger Vapor Intrusion Model for a Site Worker
ConocoPhillips Bulk/Container Storage Unit Phase I Closure Sampling
Data Entry Sheet

SG-ADV Version 2.0; 02/03

Reset to Defaults

DTSC / HERD
Version 2.0-mod1; 07/03

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
100414	1.80E+01			Ethylbenzene

MORE

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, h_B (Enter value or 0) (cm)	ENTER Thickness of soil stratum C, h_C (Enter value or 0) (cm)	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of Ls (cell F24)					
15	244	20	244			LS		

MORE

ENTER Stratum A SCS soil type (Lookup Soil Parameters)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type (Lookup Soil Parameters)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type (Lookup Soil Parameters)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
LS	1.66	0.375	0.054	S	1.66	0.375	0.054	S	1.66	0.375	0.054

MORE

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	366	0.1	0.25	

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	25	25	250

END

Table E-29

Johnson-Ettinger Vapor Intrusion Model for a Site Worker
ConocoPhillips Bulk/Container Storage Unit Phase I Closure Sampling
Results Sheet

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
2.4E-09	3.0E-06

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

END

Table E-30

Johnson-Ettinger Vapor Intrusion Model for a Hypothetical Future Resident
ConocoPhillips Bulk/Container Storage Unit Phase I Closure Sampling
Data Entry Sheet

SG-ADV Version 2.0; 02/03

DTSC / HERD
Version 2.0-mod1; 07/03

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
100414	1.80E+01			Ethylbenzene

MORE

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of Ls (cell F24)					
15	244	20	244			LS		

MORE

ENTER Stratum A SCS soil type (Lookup Soil Parameters)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type (Lookup Soil Parameters)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type (Lookup Soil Parameters)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
LS	1.66	0.375	0.054	S	1.66	0.375	0.054	S	1.66	0.375	0.054

MORE

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	366	0.1	0.25	

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

Table E-30

Johnson-Ettinger Vapor Intrusion Model for a Hypothetical Future Resident
ConocoPhillips Bulk/Container Storage Unit Phase I Closure Sampling
Results Sheet

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
4.0E-09	4.3E-06

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

END

Table E-31

Johnson-Ettinger Vapor Intrusion Model for a Site Worker
ConocoPhillips Bulk/Container Storage Unit
Data Entry Sheet

SG-ADV Version 2.0; 02/03

Reset to Defaults

DTSC / HERD
Version 2.0-mod1; 07/03

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
110543	2.70E+02			Hexane

MORE

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of Ls (cell F24)					
15	244	20	244			LS		

MORE

ENTER Stratum A SCS soil type	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
Lookup Soil Parameters				Lookup Soil Parameters				Lookup Soil Parameters			
LS	1.66	0.375	0.054	S	1.66	0.375	0.054	S	1.66	0.375	0.054

MORE

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	366	0.1	0.25	

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	25	25	250

END

Table E-31

Johnson-Ettinger Vapor Intrusion Model for a Site Worker
ConocoPhillips Bulk/Container Storage Unit Phase I Closure Sampling
Results Sheet

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	1.5E-05

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

END

Table E-32

Johnson-Ettinger Vapor Intrusion Model for a Hypothetical Future Resident
ConocoPhillips Bulk/Container Storage Unit Phase I Closure Sampling
Data Entry Sheet

SG-ADV Version 2.0; 02/03

Reset to Defaults

DTSC / HERD
Version 2.0-mod1; 07/03

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
110543	2.70E+02			Hexane

MORE

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Totals must add up to value of Ls (cell F24) Thickness of soil stratum A, h_A (cm)	Thickness of soil stratum B, (Enter value or 0) h_B (cm)	Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
15	244	20	244			LS		

MORE

ENTER Stratum A SCS soil type (Lookup Soil Parameters)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type (Lookup Soil Parameters)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type (Lookup Soil Parameters)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
LS	1.66	0.375	0.054	S	1.66	0.375	0.054	S	1.66	0.375	0.054

MORE

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	366	0.1	0.25	

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

Table E-32

Johnson-Ettinger Vapor Intrusion for Hypothetical Future Resident
ConocoPhillips Bulk/Container Storage Unit Phase I Closure Sampling
Results Sheet

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	2.1E-05

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

END

Table E-33

Johnson-Ettinger Vapor Intrusion Model for a Site Worker
ConocoPhillips Bulk/Container Storage Unit Phase I Closure Sampling
Data Entry Sheet

SG-ADV Version 2.0; 02/03

Reset to Defaults

DTSC / HERD
Version 2.0-mod1; 07/03

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
78933	1.90E+01			Methylethylketone (2-butanone)

MORE

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Totals must add up to value of Ls (cell F24) Thickness of soil stratum A, h_A (cm)	Thickness of soil stratum B, (Enter value or 0) h_B (cm)	Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
15	244	20	244			LS		

MORE

ENTER Stratum A SCS soil type (Lookup Soil Parameters)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type (Lookup Soil Parameters)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type (Lookup Soil Parameters)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
LS	1.66	0.375	0.054	S	1.66	0.375	0.054	S	1.66	0.375	0.054

MORE

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	366	0.1	0.25	

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	25	25	250

END

Table E-33

Johnson-Ettinger Vapor Intrusion Model for a Site Worker
ConocoPhillips Bulk/Container Storage Unit Phase I Closure Sampling
Results Sheet

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	6.5E-06

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

END

Table E-34

Johnson-Ettinger Vapor Intrusion Model for a Hypothetical Future Resident
ConocoPhillips Bulk/Container Storage Unit Phase I Closure Sampling
Data Entry Sheet

SG-ADV Version 2.0; 02/03

Reset to Defaults

DTSC / HERD
Version 2.0-mod1; 07/03

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
78933	1.90E+01			Methylethylketone (2-butanone)

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of Ls (cell F24)					
15	244	20	244			LS		

MORE ↓

ENTER Stratum A SCS soil type (Lookup Soil Parameters)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type (Lookup Soil Parameters)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type (Lookup Soil Parameters)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
LS	1.66	0.375	0.054	S	1.66	0.375	0.054	S	1.66	0.375	0.054

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	366	0.1	0.25	

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

Table E-34

Johnson-Ettinger Vapor Intrusion Model for a Hypothetical Future Resident
ConocoPhillips Bulk/Container Storage Unit Phase I Closure Sampling
Results Sheet

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	9.2E-06

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

END

Table E-35

Johnson-Ettinger Vapor Intrusion Model for a Site Worker
ConocoPhillips Bulk/Container Storage Unit Phase I Closure Sampling
Data Entry Sheet

SG-ADV
Version 2.0; 02/03

Reset to Defaults

DTSC / HERD
Version 2.0-mod1; 07/03

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
108101	5.50E+01			Methylisobutylketone (4-methyl-2-pentanone)

MORE

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of Ls (cell F24)					
15	244	20	244			LS		

MORE

ENTER Stratum A SCS soil type (Lookup Soil Parameters)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type (Lookup Soil Parameters)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type (Lookup Soil Parameters)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
LS	1.66	0.375	0.054	S	1.66	0.375	0.054	S	1.66	0.375	0.054

MORE

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	366	0.1	0.25	

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	25	25	250

END

Table E-35

Johnson-Ettinger Vapor Intrusion Model for a Site Worker
ConocoPhillips Bulk/Container Storage Unit Phase I Closure Sampling
Results Sheet

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	2.3E-04

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

END

Table E-36

Johnson-Ettinger Vapor Intrusion Model for a Hypothetical Future Resident
ConocoPhillips Bulk/Container Storage Unit Phase I Closure Sampling
Data Entry Sheet

SG-ADV
Version 2.0; 02/03

Reset to Defaults

DTSC / HERD
Version 2.0-mod1; 07/03

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
108101	5.50E+01			Methylisobutylketone (4-methyl-2-pentanone)

MORE

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of Ls (cell F24)					
15	244	20	244			LS		

MORE

ENTER Stratum A SCS soil type	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
Lookup Soil Parameters				Lookup Soil Parameters				Lookup Soil Parameters			
LS	1.66	0.375	0.054	S	1.66	0.375	0.054	S	1.66	0.375	0.054

MORE

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	366	0.1	0.25	

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

Table E-36

Johnson-Ettinger Vapor Intrusion Model for a Hypothetical Future Resident
ConocoPhillips Bulk/Container Storage Unit Phase I Closure Sampling
Results Sheet

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	3.3E-04

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

END

Appendix F

Excerpts from August 2003 Phase I Closure Plan
(Historical Waste Information)
(Analytical Sampling Information)

Prepared for
ConocoPhillips Company
San Francisco Refinery
Rodeo, California

ConocoPhillips Company
San Francisco Refinery
Rodeo, California

Phase I Closure Work Plan
Bulk/Container Storage Unit
San Francisco Refinery, Rodeo, California

August 2003

Prepared by:
MWH
1340 Treat Blvd., Suite 300
Walnut Creek, California

PHASE I CLOSURE WORK PLAN
BULK / CONTAINER STORAGE UNIT
SAN FRANCISCO REFINERY, RODEO, CALIFORIA

Prepared for:

ConocoPhillips Company
Environmental Services Department
1380 San Pablo Avenue
Rodeo, CA 94572

Prepared by:

MWH
1340 Treat Blvd., Suite 300
Walnut Creek, CA 94597

August 29, 2003

MWH
Prepared by:

//Original Signed By //

Andrew Kerr, R.G.
Project Manager

MWH
Approved by:

// Original Signed By //

Robert G. Aaserude, P.E.
Principal Engineer

REGISTERED GEOLOGIST
ANDREW V. KERR
No. 7140
STATE OF CALIFORNIA

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LIST OF ACRONYMS

ASTM	American Society for Testing Methodology
AVOCs	aromatic volatile organic compounds
bgs	below ground surface
BCSU	Bulk / Container Storage Unit
BTEX	benzene, toluene, ethylbenzene, and total xylenes
CCDEH	Contra Costa County Department of Environmental Health
CCR	California Code of Regulations
cm	centimeter
COC	chain of custody
COPCs	chemicals of potential concern
CSM	conceptual site model
DTSC	Department of Toxic Substance Control
DOT	United States Department of Transportation
EPA	United States Environmental Protection Agency
IWS	Inactive Waste Site
mL	milliliter
msl	mean sea level
MTBE	methyl tertiary butyl ether
NOD	Notice of Deficiency
PAH	polynuclear aromatic hydrocarbons
PCB	polychlorinated biphenyls
PID	photoionization detector
PVC	polyvinyl chloride
QC	quality control
RCRA	Resource Conservation and Recovery Act
RWQCB	Regional Water Quality Control Board
SFR	San Francisco Refinery
SVOCs	semi-volatile organic compounds
TPH	total petroleum hydrocarbons
TPH-d	total petroleum hydrocarbons as diesel
TPH-mo	total petroleum hydrocarbons as motor oil
TSDFs	Treatment, Storage, and Disposal Facilities
mg/L	milligrams per liter
ug/L	micrograms per liter
mg/kg	milligrams per kilogram
ug/kg	micrograms per kilogram
USA	Underground Service Alert
USCS	United Soils Classification System
USGS	United States Geological Survey
VOCs	volatile organic compounds
WWTP	Waste Water Treatment Plant

2.0 CONCEPTUAL SITE MODEL

2.1 HAZARDOUS WASTES STORED AT THE BCSU / CONTAMINANT SOURCES

The BCSU is permitted to accept Federal (RCRA) and State (non-RCRA) hazardous wastes and non-hazardous wastes. Wastes that have been handled at the BCSU span a wide range of materials, including washwaters and industrial trash, spent solvents, waste metals, catalysts, and oily sludge. A categorized list of wastes historically stored at the BCSU can be found in Table 1. Sources of chemicals of potential concern (COPCs) at the BCSU originate from the storage of these wastes. Historic leaks, spills, or improper handling are all factors that may have contributed to COPCs being present at the BCSU.

2.2 CONDITION OF THE BCSU COMPONENTS

The condition of the BCSU components was most recently formally assessed in 1994 during an engineering certification completed as part of the SFR Part B Permit Application. The certification process concluded that the BCSU was appropriate for the intended use as a temporary waste storage area using containers and holding tanks, as the apparent construction and condition indicated no major flaws or deterioration. The primary recommendations regarding the condition of the BCSU components included:

- The metal structures should be inspected periodically to verify that design conditions are maintained.
- The asphalt pads should be monitored and patched when gouges allow contact with the underlying surface, or the underlying soil.

A copy of the inspection is included in Appendix D.

More recent visual surveys and inspections by SFR and DTSC staff have indicated the overall condition of the BCSU to be good, with the need for minor repairs to the asphalt paving in Area

3.3 CONFIRMATION SAMPLING PLAN

Confirmation samples will be collected and chemically tested to confirm that sufficient decontamination was performed as described in Section 3.2. In addition, subsurface soil and groundwater samples will be collected to assess the integrity of the concrete containment pads and asphalt areas, and to identify potential releases to the subsurface. The proposed chemical testing program and specific sample locations are described below.

3.3.1 Chemical Testing Plan

Confirmation samples will be chemically tested within six primary analyte categories (TPH, VOCs, SVOCs, metals, PCBs, and pH) using established EPA test methods. The analyte categories were chosen by grouping the different hazardous wastes that have been historically handled at the BCSU, and identifying typical chemical testing categories that would detect residual contamination from each group. The groupings of the wastes, the chemical testing categories that will be used, and the established EPA test methods are listed below:

Groupings of Wastes Handled at the BCSU ***(see Table 1 for more detailed list)***	**Assigned Chemical Testing Category**	**Proposed Test Method**
Refinery sludge, spent filters, oily trash, refractory, oily soil, greases and grease solids, lubricants, residual hydrocarbons.	Extractable TPH	TPH-d and motor oil (TPH-mo) by EPA Method 8015M with silica gel cleanup for soil and water samples (prep method EPA 3630C)
Solvents, cleaning solution, Freon, gasoline dyes, primary gasoline components (BTEX).	VOCs	EPA Method 8260B (w/ prep method 5035 for soil samples)
Solvents, cleaning solution, phenols, PAHs.	SVOCs	EPA Method 8270C
Spent catalysts, waste metals, sand blast grit, rust, sludge, tetraethyl lead.	Metals - California Title 22 Metals, including: *Antimony, arsenic, barium, beryllium, cadmium, total chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium, and zinc.*	EPA Methods 6010B/6020 and 7471
PCB oils, PCB wastes.	PCBs	EPA Method 8082
Caustics and acids.	pH	EPA Method 9045C

The individual chemical testing program for each type of confirmation samples (e.g. asphalt chip, concrete chip, soil, groundwater) is described in the following subsections, and summarized in Table 2. Chemical testing will be completed per the procedures recommended in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," U.S. EPA, SW-846. Sample collection procedures are presented in Section 4.0, Methods and Procedures.

3.3.2 Sampling of the Asphalt/Concrete Cover and Concrete Containment Pads

Twenty-five asphalt and 17 concrete chip samples (plus 5 duplicates) will be collected to assess the effectiveness of decontamination of the asphalt/concrete cover and the concrete containment pads, and to evaluate the extent to which residual COPCs remain in these features. The samples are proposed to be collected from the following three areas: (1) potentially affected areas, including those with noticeable stains and/or areas of low elevation (sumps and/or catch basins), (2) areas where wastes could have entered the subsurface (cracks in asphalt or concrete, separated joints), and (3) other appropriate site locations. The proposed chip sample locations are shown in Figure 10.

The proposed asphalt chip samples will include 19 samples collected from the uppermost surface (0 to 1 inch depth), six samples collected from a deeper interval, and 3 duplicates. The six deeper samples will be collected at depth below the shallow samples, with the intent of establishing sample pairs. This sampling approach is proposed based on the results of the 1988/1989 Bulk Storage Area closure, which revealed that COPCs were present in the uppermost portions of the concrete containment pads, but attenuated very quickly with depth below the top surface. At this time, the proposed sample depth for the deeper samples is 3 to 4 inches, but it will depend on the actual thickness of asphalt that is encountered during the field activities.

Concrete samples will include 10 from the uppermost surface (0 to 1 inch depth), five (5) from a deeper interval that is paired with the shallow samples, and two duplicates. At this time, the proposed sample depth for the deeper samples is 5 to 6 inches, which is the same interval of the deeper samples collected during the Bulk Storage Unit closure process. The concrete samples

are not recommended to be collected any deeper, so as to protect the integrity of the current pads and the underlying geotextile membrane.

Each concrete chip sample will be chemically tested for VOCs, SVOCs, TPH-d and TPH-mo, and California Title 22 Metals per the EPA test methods described above and presented in Table 2. Concrete samples are not proposed to be sampled for pH given its natural alkalinity. The two concrete chip samples closest to the former PCB storage shed will also be tested for PCBs per the test method included in Table 2. Asphalt chip samples will be tested for VOCs, metals, and pH; they will not be tested for TPH or SVOCs because the chemicals that are included in these general categories are primary components of asphalt, and would not yield useful results.

3.3.3 Sampling Beneath the Concrete Containment Pads

Soil and groundwater samples from beneath the concrete containment pad are not proposed at this time for several reasons. The integrity of the concrete pads and the underlying membrane liner are important to the future use of the BCSU for 90-day accumulation status, and information available to date suggests both are intact. In addition, the chemical testing and soil excavation programs that were conducted in 1988 / 1989 suggested that some residual metals and petroleum hydrocarbons are present in the soils beneath the BCSU. The general soil and groundwater sampling proposed in Section 3.3.5 should be sufficient to identify typical soil and groundwater quality beneath the BCSU.

As an alternative, the sump that is designed to drain the tertiary containment systems (e.g., above the impermeable membrane) will be checked for fluid accumulation. If liquid is present, it will be sampled and chemically tested for TPH-d and TPH-mo, VOCs, SVOCs, California metals, and pH using the methods described above.

3.3.4 Wipe Sampling of the Decontaminated Equipment

Nineteen wipe samples are proposed to assess the effectiveness of equipment decontamination activities at the BCSU. Proposed wipe samples include two from each of the three polyethylene storage tanks, two from the piping associated with each tank, two from the two steel stairways, one from each of the three refinery sewer system catch basins, and one from each concrete pad collection trench grating. Proposed samples locations are shown in Figure 10. Samples will be collected by wiping a measured area of surface, tentatively set as a 10 centimeters (cm) by 10 cm area of surface with a filter of specified size (approximately 10 cm diameter). Samples will be collected from areas of the equipment that are not painted and are not corroded. Five quality assurance/quality control wipe samples will be collected, including one wipe blank, two wipe duplicates, and two background wipe samples.

Each wipe sample will be chemically tested for TPH-d and TPH-mo, SVOCs, and California metals using the methods presented above and in Table 2. The wipe sample from the lower terrace, collection trench grate will also be tested for PCBs using EPA Method 8082, given its location relative to the shed in which PCB wastes were stored. Wipe samples will not be tested for VOCs and pH given their unlikely presence due to the exposure of the sample surface to the atmosphere and the steam-cleaning decontamination process.

3.3.5 Sitewide Soil and Groundwater Sampling

Eight soil borings are proposed to be completed at the BCSU to assess subsurface soil (and as available groundwater) quality. Proposed locations are shown in Figure 10. Boring locations were chosen in order to assess the soil and groundwater quality near the concrete containment pads and identify if COPCs are present in the subsurface. Boring locations may be adjusted during the completion of field activities to account for areas where there is a higher potential for release to the subsurface, such as areas of low elevation or at noticeable seams or cracks in the asphalt and/or concrete pads.

Soil borings will be advanced to approximately 10 feet bgs as subsurface conditions allow. Two soil samples are proposed to be collected from each boring, including one just below the asphaltic cover (approximately 0.5 to 1.0 feet bgs), and a second at an approximate depth of 8 to 9 feet bgs. Sample depths may be adjusted during the field activities if staining or odors are noted.

Each soil sample will be chemically tested for VOCs, SVOCs, TPH-d and TPH-mo, metals, and pH using the methods presented above and in Table 2. Soil samples from the two soil borings nearest the former PCB shed will also be tested for PCBs using EPA Method 8082. Please note that the proposed VOC test method for each soil sample includes the sample preparation method 5035, implemented using EnCore™ (or equivalent) field sampling procedures.

Groundwater grab samples will be collected from the soil borings if encountered. If groundwater does not accumulate in the borings, a groundwater sample representative of downgradient groundwater quality will be sought by extending one soil boring to a deeper depth. The groundwater sample(s) would be chemically tested for VOCs, SVOCs, TPH-d and TPH-mo, metals, and pH using the methods described above and in Table 2.

3.3.6 Decontamination Water

Wash and rinse waters generated during site-wide decontamination activities will be composite sampled and chemically tested for VOCs, SVOCs, TPH-d and TPH-mo, metals, and pH using the methods described above and in Table 2.

3.3.7 Background Samples

Six background samples, including two concrete and four asphalt samples will be collected to help evaluate performance standards for decontamination. Each background sample will be collected from the top of the containment curbing in an area that appears not to be affected by past releases of hazardous substances or routine exposure to contaminants from regular SFR operations. Proposed locations are shown in Figure 10. The concrete background samples will

be chemically tested for TPH-d, TPH-mo, and metals, while the asphalt samples will be tested for VOCs, metals, and pH. Because naturally occurring concentrations of COPCs (principally metals) can vary in different batches of concrete and asphalt, background chip samples will collected from similar batches of concrete and asphalt if possible. The new background samples will supplement the five background concrete samples chemically tested during the Bulk Storage Area closure.

3.4 EQUIPMENT DEMOBILIZATION

ConocoPhillips expects decontamination activities to be sufficiently effective that the containment pads will remain in place, and the storage tanks can be reused.

TABLE 1
WASTES HANDLED AT THE BULK / CONTAINER STORAGE UNIT HISTORICALLY
BULK / CONTAINER STORAGE UNIT CLOSURE

State Waste Code	Federal Waste Code	Waste Description (common name)	Point of Waste Generation
121	D002, D010	MEA Sol'n	Units 215, 233 - 238
↓	D002, D004 - D011	Caustic (mixture)	All Units
↓	D002, D004 - D011	Spent Cleaning Sol'n	All Units
122	D002	MEA Sol'n	Units 215, 233 - 238
↓	D002	Caustic (mixture)	All Units
↓	D002	Spent Cleaning Sol'n	All Units
↓	D002	Ion Exchange Waters	Units 224 - 248, spp
131	D003 - D011	Sour Tank Waters	All Units
↓	D003, D010	MEA Sol'n	Units 215, 233 - 238
132	D002, D010	Monoethanolamine Sol'n	Unit 240-4
↓	D004 - D011	Spent Cleaning Sol'n	All Units
↓	D010	MEA Sol'n	Units 215, 233 - 238
↓	N/A	Catacarb Sol'n	Unit 240
↓	N/A	Stretford Sol'n	Unit 240
↓	N/A	Sludge	All units
↓	D004 - D011	Process Washwater	All Units
↓	D004 - D011	Cooling Tower Waters	Units 200 - 240, gwc
133	D010	MEA Sol'n	Units 215, 233 - 238
↓	N/A	Soda Ash	Unit 240 Plt-2
134	D010	MEA Sol'n	Units 215, 233 - 238
135	N/A	Washwater (no-oily)	All Units, Shops
141	D002	Caustic	All Units
↓	D002 - D011	Retrograde Chemicals	All Units, Shops
↓	U-Wastes	Retrograde Chemicals	All Units, Shops
↓	N/A	Stretford Sol'n	Unit 236
151	N/A	Asbestos	All Units
162	D001, D003 - D011	Spent Catalysts	Units 228 - 231
↓	D018		234 - 238, 240 - 244
181	D002	Anion/Cation Resin	SPP
↓	D007	Waste (Chromium)	All Units
↓	D008	Waste (Lead)	All Units, Shops
↓	D009	Waste (Mercury)	All Units, Shop, Lab
↓	D010	Waste (Selenium)	Unit 100
↓	D004 - D011	Sand Blast Grit	All Units, Shops
↓	D004 - D011	Rust	All Units, Shops
↓	D018	Dessicants	Unit 228
↓	N/A	Filters - Spent	All Units
↓	N/A	Industrial/Oily Trash	All Units, Shops
↓	N/A	Industrial Waste	All Units, Shops
↓	N/A	Off-Grade Coke	Unit 200
↓	N/A	Refractory	All Units
↓	N/A	Stretford Solids	Units 234 - 238
↓	N/A	Off-Grade Sulfur	Units 234 - 238
↓	N/A	Sludge	All units
211	F001, F002	Spent Solvents	Shops, Lab
213	D035, F001, F003, F005	Spent Solvents	All Units, Shops, Lab
214	D001, D004 - D043	Mixed Solvents	All Units, Shops, Lab

TABLE 1
WASTES HANDLED AT THE BULK / CONTAINER STORAGE UNIT HISTORICALLY
BULK / CONTAINER STORAGE UNIT CLOSURE

State Waste Code	Federal Waste Code	Waste Description (common name)	Point of Waste Generation
222	F038, K048, F051	Oily Wastes - Listed Refinery Sludges	Unit 100
223	D001, D003 - D043	Oily Wastes	All Units
241	F037, K049, K052	Oily Bottoms - Listed Refinery Sludges	Units 80, 100
	D001, D003 - D043	Oily Bottoms	All Units
	D010	MEA Sludge	Units 215, 233 - 238
	N/A	Soda Ash	Unit 240 Plt-2
261	N/A	Wastes (PCB)	Utilities
322	N/A	Bio-Plant Sludge	Unit 100
331	D001	Dyes - Gasoline	Units 76, 80
	D004 - D011	Lubricants	All Units, Shops
	D001 - D043	Retrograde Chemicals	All Units, Shops
	U-Wastes	Retrograde Chemicals	All Units, Shops
	N/A	Foots Oil/Tallow	gwc, Marine Terminal
341	N/A	Freon (non-solvent)	All Units
343	D001 - D043	Liquid Mixtures	All Units, Shops
	D005	Greases	All Units, Shops
352	D004 - D043	Residual Hydrocarbons	All Units
	D004 - D011, D018	Wastes (phenol)	Unit 220
	D005	Grease Solids	All Units, Shops
461	D001, D004 - D043	Paint Wastes	All Units, Shops
491	F037, K050	Oily Sludges - Listed Refinery Wastes	All Units
	D001 - D043	Oily Sludges	All Units
	D002 - D011	Sludge (non-oily)	All Units
	N/A	Cooling Box Sediments	All Units
	D004 - D011	Cooling Tower Sediments	Units 200 - 240, gwc
512	N/A	Empty Containers	All Units, Shops, Lab
513	N/A	Empty Containers	All Units, Shops, Lab
541	D011	Photographic Sol'n	Eng./Inspect. Lab
551	D002 - D011	Inorganic Mixtures	Lab
	D001 - D043	Organic Mixtures	Lab
	D001 - D043	Retrograde Chemicals	Lab
	U-Wastes	Retrograde Chemicals	Lab
611	D004 - D043	Contaminated Soil	All Units
726	D002	Chemical (nickel)	Shops
731	N/A	Oils (PCB)	Utilities
741	F-002, U-226	Freon (Solvent), TCA	All Units, Shops, Lab
791	D002	Acid	All Units, Lab
	D002	Ion Exchange Waters	Units 224 - 248, spp
791	D002	Retrograde Chemicals	Unit 228
792	D007	Acid (chromic)	Lab

gwc: Grease/Wax Complex
MEA: Monoethanolamine
spp: Steam Power Plant
PCB: Polychlorinated Biphenyl
TCA: Trichloroethane
TEL: Tetraethyl Lead

TABLE 2
ANALYTICAL TEST METHODS AND ANTICIPATED REPORTING LIMITS FOR COPCs
BULK / CONTAINER STORAGE UNIT CLOSURE

Chemical Category	EPA Test Methods	Matrix	Sample Container	Anticipated Reporting Limit
Total Petroleum Hydrocarbons (TPH)	TPH-d and TPH-mo by EPA Method 8015M (w/ silica gel cleanup by EPA 3630C for soil and gw samples)	**Soil:**	brass tube or acetate liner	50 µg/kg
		Water:	1 L amber jar	50 µg/L
		Concrete Chips:	16 oz. glass jar	5 mg/kg
		Wipe:	wipe placed into 40 ml VOA vial	300 ug/10cm2
Volatile Organic Compounds (VOCs)	EPA Method 8260B (w/ EPA 5035 sample prep for soil)	**Soil:**	brass tube or acetate liner	5-20 µg/kg
		Water:	amber 40 mL VOAs w/HCl	1-5 µg/L
		Concrete/Asphalt Chips:	16 oz. glass jar	100-200 µg/kg
		Wipe:	-	-
Semivolatile Organic Compounds (SVOCs)	EPA Method 8270C	**Soil:**	brass tube or acetate liner	0.7-3.3 mg/kg
		Water:	1 L amber jar	10-50 µg/L
		Concrete Chips:	16 oz. glass jar	1-2 mg/kg
		Wipe:	wipe placed into 40 ml VOA vial	0.1 ug/10cm2
California Title 22 Metals	EPA Methods 6010B, 6020, and 7471	**Soil:**	brass tube or acetate liner	5-10 µg/kg
		Water:	1 L polyethylene w/HNO_3	2-10 µg/L
		Concrete/Asphalt Chips:	16 oz. glass jar	50 µg/kg
		Wipe:	wipe placed into 40 ml VOA vial	0.02 to 2.0 ug/10cm2
Polychlorinated Biphenyls (PCBs)	EPA Method 8082	**Soil:**	brass tube or acetate liner	5 µg/kg
		Water:	1 L amber jar	0.5 µg/L
		Concrete Chips:	16 oz. glass jar	50-100 µg/kg
		Wipe:	-	-
pH	EPA Method 9045C	**Soil:**	brass tube or acetate liner	± 0.1 pH units
		Water:	125 mL polyethylene	± 0.1 pH units
		Asphalt Chips:	16 oz. glass jar	± 0.1 pH units
		Wipe:	-	-